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The Journal

OF THE

Ministry of Agriculture

MAY, 1920.

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LONDON:

PRINTED UNDER THE AUTHORITY OF HIS MAJESTY'S STATIONERY OFFICE,
AND PUBLISHED BY THE MINISTRY OF AGRICULTURE AND FISHERIES.

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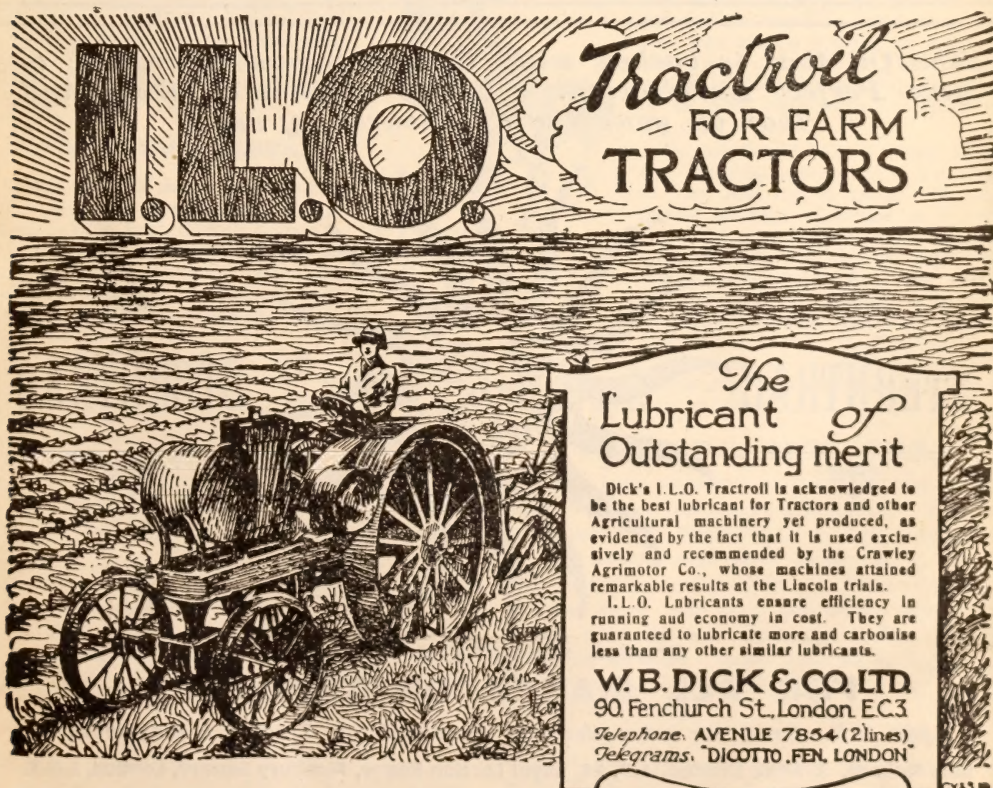
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How I Make Big Money Out of Unmanageable Horses.

By J. A. BUTLER.

ABOUT two years ago, when I was in America, I witnessed up in New York State an exhibition of horse-training that opened my eyes. A man by the name of Mackley took a devil of a mean, vicious mare that hadn't been harnessed for seven months, and in a few days had her gentle enough for a schoolgirl to drive. Mackley had taken the mare off the owner's hands for £10, and just ten days after sold her for £35. A clear profit of £25 in ten days.

That started me investigating. I learned that Mackley had simply used the methods introduced by the famous horse-trainer, Jesse Beery. Beery, I learned, used to go about the country giving wonderful exhibitions in colt-breaking and horse-training; but realising that he could accomplish more by teaching his methods by post, had given up his exhibition work to spread his horse-training secrets by postal instruction. Mackley had studied Beery's Course in his spare time and in a few months was able to accomplish magical results with unbroken colts and horses with bad habits.

OTHER SUCCESSES.

Mackley's work showed me a way to make some easy money and I determined to take Prof. Beery's Course in horse-training—but before doing so I made further inquiries. Here are what a few of Beery's students said. I'll let them tell of their success in their own words.

Mr. S. L. Arrant writes: Just to test Beery's methods, I bought the worst balky, kicking, fighting horse I could find. Paid £13 for him. After handling him only a few hours according to Beery's system, I sold him for £27.

Mr. Dell Nicholson writes: I have trained a four-year-old mare that was given up by everybody. Bought her for £7, and now have her so gentle, my little boy handles her. Wouldn't take £40 for her.

Dean L. Smith writes: By following Beery's instructions have changed a worthless, dangerous balker into a horse worth £45.

Everett McBlock, Elkhart, writes: Have just broken a pony to drive and taught it some tricks. Owner bought it for £3 10s. Paid me £8 to train it. He just sold it to a show company for £30.

HOW I WORK.

The big source of my income is in buying up unmanageable colts and horses at bargain prices, and, after training the animals, selling them at a

good profit. However, I also pick up good money handling colts and training horses for others on a fee basis. For instance, a farmer had a beautiful driving bay that had the bad habit of shying. A piece of paper blowing across the road would set the horse crazy. The owner thought a great deal of the animal, but couldn't take chances on the shying habit. A friend of his for whom I had done some work put this man in touch with me and in a few hours I had the horse completely cured of the habit—for which job I received £10.

CURING BAD HABITS.

You can see from this that my work consists not only in breaking colts and "gentling" vicious horses, but in curing the various bad habits a horse can have—such as shying, balking, fear of motor-cars, etc., pulling at hitching strap, pawing in the stall, etc., etc.—Beery's methods of colt-breaking are particularly amazing. Under the old way of handling raw colts, one usually had to half kill the horse as well as himself to accomplish anything—and then the colt was usually spoiled or hurt in some way or another. But, when you apply Beery's principles, there is no hard, long work or injury to the colt.

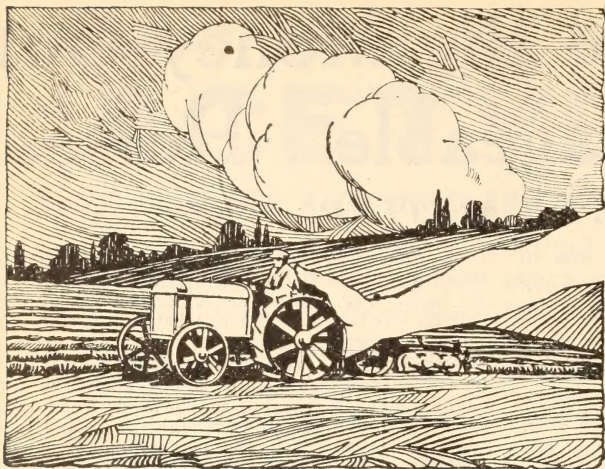
No one should have a biting, kicking, or balky horse when it is so easy to cure these vicious habits. No one should attempt to break in a colt the old-fashioned way when Beery's methods make the task so easy. To every horse-owner, to every lover of horsemanship, my advice is to get acquainted with the Beery principles. You can not only make money for yourself, but you can do a world of good, particularly at this day when war-demands have placed a premium on horses.

WONDERFUL BOOK FREE.

I have been requested to state that Prof. Jesse Beery will send his remarkable booklet "How to Break and Train Horses," free to those interested. It is a booklet well worth having as it reveals some startling information on horse-training. I have heard men who considered themselves expert horsemen say that the booklet was a revelation to them. There is no use in my going into details on the booklet when you can get it free for the asking.

Just drop a line to Prof. Jesse Beery, Dept. 142, Pleasant Hill, Ohio, U.S.A., and the booklet will be sent free by return of post. A postcard (1d. stamp) will do as well as a letter.





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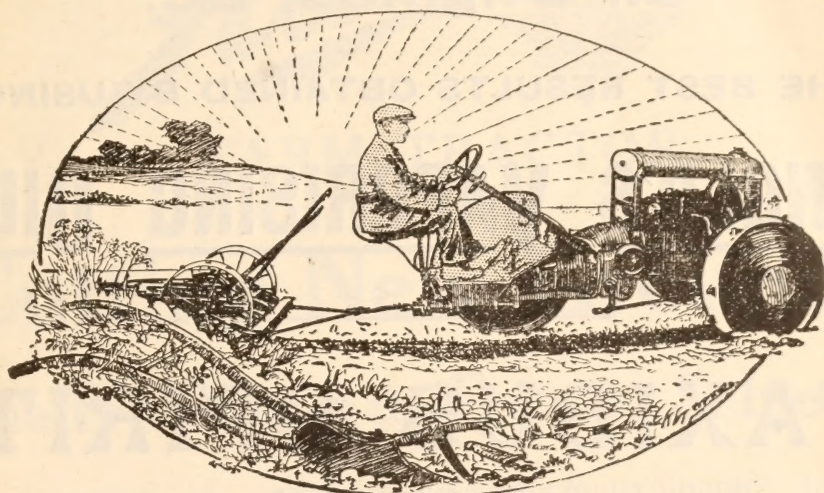


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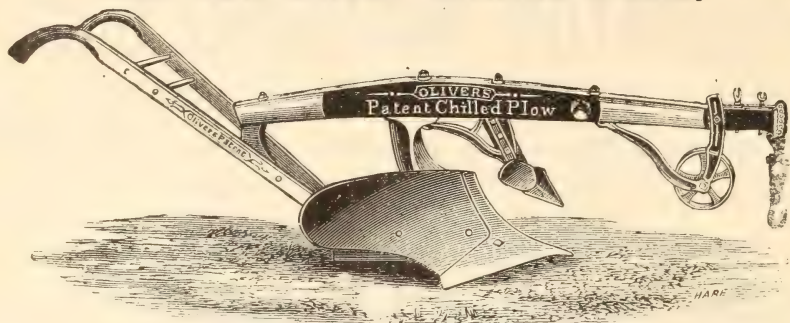
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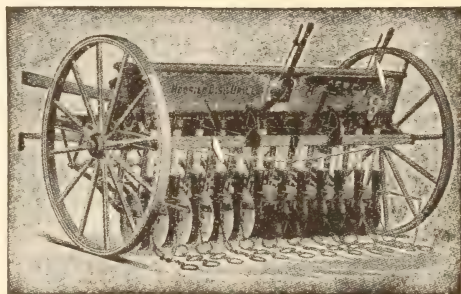


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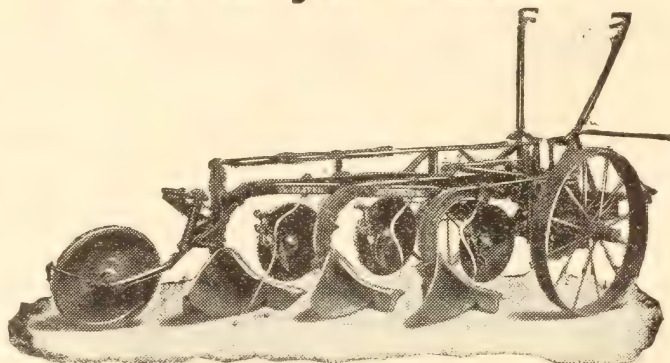
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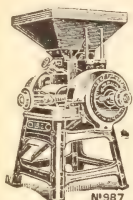
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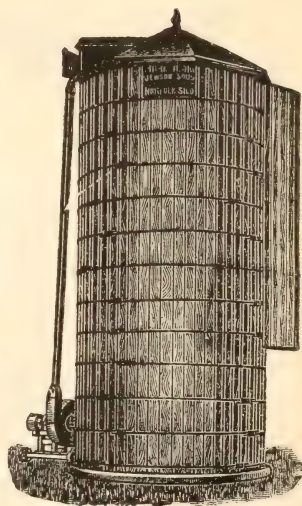
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NOTES.

THE month of April has played a prominent part in this year's agricultural history. Coming after two fine months,

in which farmers had gone well ahead with their work, the succession of wet and sunless days threw them, in many parts of the country, out of their stride. With the coming of May, large areas set aside for potatoes remained unplanted, fields prepared for oats and barley were left undrilled, while to make matters worse there has been a remarkable outburst of weed life, stimulated no doubt by the mild winter, the warmth of the land in the beginning of spring, and the subsequent heavy rains. Weeds have proved a serious factor, not only in the fields, where the cost of labour does not invite hoeing, but in the market gardens, where their presence among young seedlings compels an expenditure of effort that is needed badly in other directions. The question of the effect of rains upon fruit blossom is not yet settled. In all probability the early plums, damsons and open-air peaches and nectarines suffered little hurt, but a certain proportion of the later fruit will have failed to set.

Certainly the farmers' prospects at the end of April were not as good as they appeared to be at the end of March, even although a bountiful hay crop would appear to be assured.

FARMERS who have been unable to obtain delivery of basic slag are advised not to cancel their orders. Basic slag, applied at midsummer, may prove quite as effective as when applied in winter. There is a case on record where a summer application had results little short of marvellous.

**Summer Application
of Basic Slag to
Pastures.**

In an experiment conducted over a considerable number of years, at Sevington in Hampshire, some ten different methods of manuring grass land were tried. Sheep were grazed on the different plots, and were weighed from time to time. One plot of 3 acres (Plot No. 2) had received 4 tons of lime per acre in 1901. On 13th June, 1907, it received 5 cwt. of basic slag, equal to 100 lb. of phosphoric acid per acre. Mr. Ashcroft, Steward of the Bath and West Agricultural Society, reporting on the experiment, says: "The application of 5 cwt. of basic slag to this plot on 13th June wrought a marvellous transformation. It is commonly said that basic slag requires time and plenty of rainfall before any effect can be seen, but by the August weighing, 8 weeks afterwards, the change in the appearance of the plot was quite evident, and all through the following two months perfectly remarkable; plenty of healthy-looking small clover herbage all over the plot. It was most interesting to observe how the sheep immediately bore witness to the improvement. On Plot 2 the increase of weight per sheep in the fourth month was 9.1 lb. No other plot approached that, not even where sheep were having cake, and the total increase for the fourth, fifth, and sixth months together was 17.6 lb., which again is higher than any other plot." In his report for the next season, the eighth, Mr. Ashcroft thus expresses himself: "As soon as ever any chance of growth came this spring, the plot became full of clover herbage which grew so luxuriantly that 10 sheep were increased to 12 at the weighing in May, and to 14 at the weighing 2nd July. The contrast between Plot 2 and all other plots, so deficient, comparatively speaking, in clovers and bottom herbage, was extraordinary, and perhaps all the more so in a season little favourable to growth. From being at the very bottom of all the manured plots, and very often lower than the untreated one, Plot 2 jumps at once to the top, and gives a total increase of 594 lb., a result which has never been obtained any season on any of the manured plots, and only exceeded by the sheep receiving 1 lb. of cake per day on Plot 1 in 1907 and 1908. In the third month the sheep on Plot 2 averaged an increase of 20.1 lb. per sheep, beating the sheep on Plot 1, getting a pound of cake, which averaged 18 lb. per sheep."

There are other advantages in summer applications—the land is then drier and carries the cart more easily, farm work is not very pressing, demand is less, and better delivery may be hoped for.

The higher the grade the less the cost of carriage, otherwise, provided equal weights of phosphate are applied, the lower grades, though not so quick acting, may be counted on to give as good, or nearly as good results in the end as the higher. It is generally believed that it is not well to turn pregnant stock on to newly-slugged land before rain has washed the slag off the herbage, and it is possibly better not to do so. Generally speaking, however, there is no fear of stock suffering from grazing newly-slugged land. As soon as the slag begins to take effect it will be found, in cases where pastures have only been slugged in parts, that the stock concentrate on the slugged portions, and consequently these look barer than the unslugged. This result, viewed apart from its cause, sometimes makes farmers needlessly doubtful as to the good effects of slugging.

Where it is impossible to obtain slag, an equivalent dressing of superphosphate and lime (1 ton per acre) should usually give as good results as the highest grade of slag. In rainy districts and on sour soils, ground mineral phosphate is practically as good as slag.

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SINCE 1916, experiments on the growth of green crops, on arable land, for the feeding of dairy cows have been carried out in North Wales under the auspices of the University College of North Wales.

Arable Dairy Farming in North Wales. Although these trials are still in the early stages, fairly definite information has already been secured with regard to the value of the soiling system under the conditions prevailing in this district.

Thus, it has been demonstrated that by sowing suitable mixtures of oats and peas or vetches, a succession of very useful green food can be secured in July and August to supplement the failing pastures, and to take the place of purchased cake and other feeding stuffs. If required, this period can be extended by autumn-sown oats and vetches which will, in most circumstances, be ready for cutting about the middle of June.

By selection of suitable varieties it will doubtless be possible to prolong the period in which green food of this kind is available into September, but for the greater part of that month it seems likely that other crops, such as white turnips or cabbages, will have to be relied on.

Rape, if sown later than about the middle of August, does not produce a crop which is of much use until the following spring, although if sown before that time a bulky crop, ready for use in November, may be expected. In North Wales comparatively heavy seeding appears to be necessary with oats, peas and vetches, but, on the other hand, light seedings of rape, kale and white turnips (sown broadcast) give heavier crops than heavy seedings. These crops also stand the winter better. For broadcast sowing, 6 lb. rape or kale and about 2 lb. white turnips per acre appear to be quite sufficient, provided that the tilth is satisfactory.

In the uncertain climate of the western district of North Wales, which often makes it impossible to get on to any but the driest land from the middle of October to the middle of March, it will probably be found impossible to develop in its entirety the soiling system worked out at the Harper Adams Agricultural College,* but a system of cropping which provides green food to supplement pasture after the end of June will be found of very great value on most dairy farms. Even allowing for the present cost of labour, the milk flow and condition of cows can be maintained more cheaply in this way than by the use of purchased cake. For instance, at the North Wales University College Farm it was estimated that the produce of about $3\frac{1}{2}$ acres took the place of about 7 tons of concentrated food, and, in view of the short pasturage available, probably maintained the flow of milk much better than the cake would have done. The cost of cultivating these crops is comparatively small, the most serious item being for labour in cutting and carting the green stuff. The possibility of securing two crops in the year adds to the advantage of the system.

The University College of North Wales has issued a detailed report on these experiments, which may be obtained from the Principal of the College at Bangor.

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THE scarcity and high cost of grass and clover seeds at the present time renders it necessary for farmers to exercise the utmost care in the selection and use of their seed. This need becomes increasingly important in view of the part the temporary ley is likely to play in the immediate future in connection with the cultivation of land recently broken out

**Grass Seed Mixtures
and Temporary Leys.**

* See this *Journal*, March, 1920, p. 1159.

of grass. Farmers would be well advised, therefore, to give special attention to the question of the choice of their grass seed mixtures.

The formation of a sward results from the combined influence of the species sown and of those that spring up naturally. A temporary ley is almost entirely dependent for valuable species on the plants that are sown. On the other hand, a permanent pasture will, at least in its more mature stage, be almost wholly dependent on indigenous species, that is to say, on plants that come in naturally.

The commercial permanent grasses and clovers are very useful in the making of temporary leys, but they are chiefly valuable because, by their use, it is possible to tide over that difficult period in the life of every prepared field between the failure of the rye-grass and clovers and the establishment of an indigenous sward. When selecting seed, whether for temporary leys or permanent grass, local knowledge is of the highest importance, as a large number of the species generally recommended do not function in many localities.

In all cases of doubt the advice of the agricultural organiser (at the offices of the County Council) should be sought.

In planning seed mixtures it is only necessary to differentiate between (*a*) one-year leys, (*b*) two-year leys, and (*c*) leys for three or more years, including permanent grass. It does not follow that the mixtures necessary under the last of these heads should be very complicated or very expensive. Some simplification and cheapening is desirable, since it is practically essential to include wild white clover in a mixture, if the best results are to be obtained.

Even at its present price $\frac{1}{2}$ lb. per acre of wild white clover is well worth sowing, since not only does it contribute greatly to the formation of a close bottom and the health and vigour of the grasses associated with it, but it leads to marked enhancement of the soil fertility.

Cases are known where the corn crop following a three-year-old ley, in the formation of which a small quantity of wild white clover was used, benefited to the extent of 16 bush. of oats per acre as compared with leys in which no wild white clover was sown. If this experience were to become general the resulting benefit on the following corn crop would be equal to or even greater than that obtainable by the use of an average dressing of sulphate of ammonia.

Many farmers in suitable districts could quite easily grow their own supplies of wild white clover. All that is necessary

is to stimulate the plant on an acre or two of pasture by a liberal dressing of phosphate, and cut the crop when dead ripe, after which it should be threshed and roughly dressed.

A further point of interest in regard to wild white clover is that fallen seeds seem capable of lying dormant throughout a rotation and springing up when next the field is sown out to ley. In such circumstances, and provided the soil in the interval is sufficiently slagged, it would seem that subsequent sowing of wild white clover could be considerably curtailed or even omitted.

One-Year Leys.—It is difficult to suggest any improvement on the usual clover, or clover and rye-grass mixtures, where these succeed, but in cases of short rotation where “clover sickness” is prevalent, attention should be given to plants that for all practical purposes are immune from this disease, e.g., white clover and trefoil. A mixture of these with ryegrasses should ensure a good plant.

Late-flowering red clover is less susceptible than broad red clover, and along with rye-grass should ensure a “stand” in all but the worst cases of clover-sick land; but if a sward of herbage plants is regarded as essential it would be best to sow down the field for two or three years, when white clover could advantageously form the clover basis of the mixture. In Essex very promising results have recently been obtained from lucerne mixed with a little wild white clover.

Two-Year Leys.—The following seeding, recommended for ordinary average soils, may be given as an example of a nucleus mixture for a two-year ley:—

	<i>Lb. per acre.</i>
Perennial rye-grass	13
Cocksfoot	6
Timothy	3
Late-flowering red clover	1½
Broad red clover	2
Commercial white clover	1
Alsike clover	1

A suitable two-year mixture for grazing on land subject to clover sickness would be:—

	<i>Lb. per acre.</i>
Perennial rye-grass	12—14
Crested dogstail	2
White clover	4—6

Three or more Years Ley.—The only important changes that need be made from the two-year mixture suggested are that $\frac{3}{4}$ lb. wild white clover may take the place of commercial white clover; or, alternatively, $\frac{1}{2}$ lb. of each may be used. In districts

of moderate or high rainfall, 1 to 2 lb. of rough-stalked meadow grass, and, in dry situations, 1 or 1½ lb. of crested dogstail, may be used in addition, to help in the formation of a close bottom.

In conclusion it may be pointed out that by the use of adequate and properly-balanced seed mixtures and the inclusion of wild white clover, a good sward can be obtained much more quickly and surely than was the case a generation ago.

* * * * *

EXPERIMENTS in co-operative dairying in recent years have demonstrated the value of this form of industry in adding to the success and profit of dairying operations. Scientific instruction in subjects connected with dairying is essential, however, for the best results to be obtained. At centres of co-operative dairying, co-operative cheese schools will prove a valuable auxiliary. Such schools should be established at a centre where the local milk producers will jointly undertake to observe the following conditions:—(1) to supply a fixed minimum quantity of, say, 200 gal. of milk per day, according to the local circumstances; (2) to accept payment for their milk on a strictly co-operative basis, calculated on the returns from the sale of cheese; (3) to appoint and place under the direction of the Head of the School, for so long as the school remains at that centre, some approved person as Manager. It should be a further provision that, in the event of a decision to make cheese co-operatively after the close of the school, the same person should be retained as Manager.

Where a County Education Authority undertakes to provide this practical form of teaching, it is usual for this body, during the period of the school, to supply the necessary apparatus and the services of an Instructor. The people of the district are accepted as daily pupils for the school after the manner of the ordinary migratory dairy schools. Persons who come from a distance may reside at or near the school for such period of instruction. The duration of a school at one centre should usually be about two months. It is, however, important that before a school is discontinued at any centre, the Education Authority should be satisfied that the people of the district have become thoroughly interested in cheese-making. The Authority will also satisfy itself that, in the event of a co-operative cheese factory being decided upon, the person who is to become Manager has become reasonably competent.

The Authority will also ascertain that all local difficulties have been overcome as far as possible and that the school has provided a thorough training in co-operation.

The Scheme, which has now been in operation some little time, has proved entirely satisfactory. The progress made is exemplified by the extent to which the Scheme has grown since it was first formed in 1916. In that year one school was established in Cornwall; in 1917, 9 co-operative schools were at work in Cornwall, Wiltshire, Herefordshire, Denbighshire, Carnarvon and Montgomery; in 1918, the number had risen to 18 schools carried on in Anglesey, Berkshire, Cheshire, Cornwall, Cumberland, Carnarvon, Denbighshire, Flintshire, Herefordshire, Montgomery and Wiltshire; in 1919, 15 schools were at work in Anglesey, Carmarthen, Carnarvon, Cheshire, Cornwall, Denbighshire, Flintshire, Montgomery and Pembroke. That the financial result was entirely satisfactory may be noted from the following figures. These are taken at random from the results of the working of 6 schools during 1918 and 1919. In 1918, 115,251 gal. of milk were made into cheese, for which the amount paid out to the suppliers of milk was £9,130 16s. 1d., or a fraction over 1s. 7d. per gal. In 1919, the total number of gal. of milk made into cheese was 118,789, for which the amount paid for milk was £11,024 5s., or a fraction over 1s. 10½d. per gal. It should be noted that, in addition to the price received for milk, some farmers took their whey for home use.

These returns compare most favourably with the average wholesale prices obtainable for milk during the corresponding periods, and demonstrate how greatly co-operative methods benefit the farmer. It must also be borne in mind that much of the milk thus profitably turned into cheese at co-operative schools was surplus, and would probably, under ordinary circumstances, not have commanded the full wholesale price.

As a result of the work of these schools 32 co-operative cheese-making societies have been definitely formed. Beginning in 1916 with 1 society, 10 more societies were formed in 1917, 10 more in 1918, and 11 more in 1919. A most encouraging instance of the success of the system here outlined occurred in a district where very little milk was produced previous to 1917. In that year a co-operative school was established, which resulted in the formation of a co-operative society. This society during 1917 dealt with 30,000 gal. of milk; in 1918, with 64,000 gal.; and in 1919 with no less than 108,000 gal. It is further claimed that these increases are entirely due to the keeping of additional cows and not to diversion of

supplies. It is also noteworthy that, notwithstanding the fact that this milk was sold either as milk or dairy products, stock-raising in the district prospered. Moreover, the increase in dairying in the district took place without any decrease in the quantity of other farm produce.

* * * * *

WHILE pigs can be kept successfully on poor and exposed land, the question of shelter from sun and cold is very important. With proper management and

**Open Air Shelters
for Pigs.**

a little ingenuity, adequate shelter can be provided at very small expenditure of

money and labour.

One method of constructing a cheap and effective shelter is to fasten four stout uprights into the ground at hurdle distance, each post forming the corner of a square. Inside and outside the posts hurdles are fastened on three sides, leaving a space the width of the post between each parallel pair. The fourth side of the square is left open and should face south. Straw is then packed between the double parallel hurdles, and similarly packed double hurdles are laid across the top to form a roof.

A second type of shelter is made by fastening wire netting both inside and outside the four stout uprights, and stuffing the intervening space with bracken. The roof may be made of faggots thatched with straw.

A third method is to use semi-circular corrugated iron for the shelter. It is essential that the pigs be supplied with plenty of dry bedding, a sufficient quantity of which will enable them to withstand considerable rigours of climate. The bedding may be of straw, dried bracken, grass or leaves. A shelter measuring roughly 8 ft. by 8 ft. will amply accommodate 12 pigs. In cases where one side is not left open, ventilation should be provided by an aperture 3 in. wide along the ridge of the structure. In this type, the entrance door might be made in two halves, the upper half being kept shut in cold weather and the lower one always open. In none of these types of shelters is a special flooring needed. It will not be necessary to make any arrangement for drainage, provided that the shelters are moved frequently to fresh ground. For pig keeping on high, exposed uplands it is advisable to use movable wood huts.

Farmers and others requiring hurdles, wire netting, corrugated iron and articles of this kind should communicate with the Officer in Charge of the Disposals Board in the area in which they reside. The addresses required are the following :—

Northern Area.—Quebec Chambers, Quebec Street, Leeds.

Southern Area.—27, High Street, Salisbury.

Eastern Area.—Room 104, Charing Cross Huts, London, W.C.

Western Area.—(Now incorporated with Northern and Southern Areas.)

Purchasers might also consult *Surplus*, the organ of the Disposals Board. It is published on the 1st and 15th of each month, and can be obtained at any railway bookstall, or through any bookseller or stationer (price 3d.).

Where the minimum quantity sold of any article required is too large for individual requirements, farmers should co-operate in a joint purchase. This is already being done in a large number of cases.

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THE Ministry has recently addressed to County Committees a memorandum containing suggestions as to methods which

**Instruction in
Poultry Keeping.**

should be followed to assist in the development of the poultry industry. The memorandum lays special stress upon the urgent need of systematic instruction by highly qualified lecturers. It is suggested that these lecturers should work in circuits at various county centres, giving, as far as possible, four lectures at each centre during each month, and that care should be taken to ensure that the instruction provided is suited to the needs of the particular district. In the more open agricultural areas lecturers should pay special attention to the problems of adapting poultry keeping to the regular routine business of the farm, so as to give the poultry full advantage of natural foods and waste ground, and let the soil receive the full benefit of the droppings from the poultry. Other more important questions for poultry keepers in such areas to consider are those connected with rearing and selling young stock.

In the more urban areas, lecturers would do well to train poultry keepers in the scientific maintenance of adult stock, and in methods of intensive and semi-intensive housing. Each circuit should have its own syllabus prepared in accordance with its local requirements. These should be drawn up by the Instructor and previously submitted for the Committee's approval. A model syllabus might include some or all the following subjects:—Capital outlay and probable returns; housing and laying out of plant; breeds and breeding; foods and method of feeding; hatching and rearing; winter egg production; prevention and treatment of disease; account keeping; marketing; management of labour; poultry keeping

combined with some form of agriculture or horticulture ; culling of stock.

For the first few years lectures by itinerant Instructors will probably serve the area or district adequately, but after this system has been well established and poultry keepers have obtained a firm grasp of general principles, it would be well to institute specialised courses of itinerant classes for limited numbers of pupils. These classes will afford more detailed instruction than can be given in short courses of public lectures. Classes should be held for at least two hours daily at each selected centre for not less than a fortnight or for more than a month. The time chosen can be either the evening or daytime, as may be most convenient. Should the attendance prove unsatisfactory, the class should be closed ; but it will be part of the duty of the Instructor to carry out recruiting by personal visits to poultry farmers near the centre for which the classes are proposed. These personal visits would stimulate interest and bring in pupils. The Instructor should be consulted by the Committee regarding the selection of centres and arrangement of classes, but all matters connected with advertising, the provision of local accommodation, fire, light and attendance, should invariably be undertaken by the Committee themselves.

In these itinerant classes practical work will play a prominent part. Pupils should take a personal share in such details of poultry keeping as egg-testing and grading ; packing eggs and poultry for transit ; killing, plucking and trussing poultry ; management of the incubator ; selection of birds by handling ; and account keeping. Lecturers are also advised to give instruction in easy carpentry, such as the making of simple appliances, chicken coops, feeding troughs, small poultry houses, egg boxes, crates and all the minor accessories of the poultry run. The Instructor should be equipped with an outfit including folding tables, trussing boards, egg boxes, coops, a small incubator and a small brooder, plucking baskets, dissecting instruments, simple carpentry tools and similar appliances, together with a supply of timber. During the course, should opportunities arise for the Instructor to conduct his pupils over neighbouring poultry farms, full advantage should be taken of this invaluable means of practical demonstration. Such visits will also lead to an instructive exchange of views. Beginners will thus be enabled to observe the methods of experienced poultry keepers, and will have before them practical illustrations of the subjects learnt in the classroom.

It is now generally recognised that education must play an important part in stimulating the use of improved machinery in agriculture. In evidence given before

**Education in the
Use of Agricultural
Machinery.**

the Departmental Committee on Agricultural Machinery this opinion was expressed by nearly all the witnesses. The raising of the standard of general education is likely to stimulate the interest and quicken the apprehension of all classes of workers in tasks other than dull routine ; and this in itself will lead to a better and more instructed use of agricultural machinery, and a broader outlook upon its possibilities. Beyond this, however, direct instruction in the principles and use of machinery is required by all classes of the agricultural community.

At present, some measure of instruction in agricultural engineering or allied subjects is provided at Agricultural Colleges and kindred Institutions, and by Local Authorities either through Farm Institutes or by means of extension lectures. The opinion of a number of well-qualified witnesses who appeared before the Committee was, however, that the present facilities were inadequate. It is urged that the subject of agricultural machinery should occupy a more prominent place in the curricula of Agricultural Colleges and Farm Institutes, and that in the case of the former there should be attached to the staff at least one specialist whose whole time would be devoted to the subject, and who would be available for instruction and advisory work. Further, there should be available at each Institution, besides the machinery and implements used on the farm, a well-equipped machinery workshop and an exhibition of the principal types of machines and implements on the market.

The facilities hitherto given have been available chiefly for those who would later farm on a fairly large scale or who would direct farming operations in some capacity or other. Less provision appears to have been made for the instruction of smaller farmers and of labourers in the principles and use of agricultural machinery, and the problem has probably been found to present greater difficulties. The Committee has come to the conclusion, after sounding the views of the witnesses best qualified to speak on this subject, that either within the continuation classes proposed under the new Education Act or outside them, some instruction in the principles of mechanics and in their practical application to agriculture might usefully be given to youths above the age of fourteen ; it is believed that in this way the interest of the man in his task would be

increased and that he would become a more intelligent and a more efficient worker. By means of short courses and extension lectures the needs of farmers and specialised workers who require more than a general knowledge of agricultural machinery could probably be met; and the Committee recommends that Local Authorities should be encouraged to provide instruction in such subjects as tractor driving and mechanics, and the principle of the internal combustion engine.

It was suggested that short courses of instruction should be provided for farm workers in regard to particular machines, such as the tractor and binder, and one witness referred to a practice of Canadian firms to give free short courses in the use and repair of tractors. Courses on similar lines in this country, conducted by the Local Authority, might be difficult to organise, but the Committee believes that the experiment would be worth trying, and has little doubt that the co-operation of at least some firms might be counted upon.

One difficulty likely to be experienced in giving effect to these proposals would be the provision of efficient instructors, and in the first instance it would probably be impossible to obtain the services of a sufficient number of men with the combination of theoretical and workshop training which the Committee would regard as the ideal. The type of instructor to be aimed at is a combination of the engineer and the agriculturist; instruction in engineering, including workshop practice, should form the basis of his training, and should be followed by instruction in agriculture. It is to be hoped that at a later stage the proposed Research Institute in Agricultural Machinery will be in a position to take some part, at least, in training of this character, although care must be exercised to prevent teaching from encroaching unduly on the research side of the Institute.

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THE Valley of the River Lugg, an important tributary of the Wye, is one of the areas for which a drainage authority

**Drainage of the
River Lugg.**

is in process of being established under the Land Drainage Act, 1918. There are within the valley about 25,000 acres of potentially cultivable land at present liable to injurious flooding, and, in addition to the areas which might come under the plough, from 6,000 to 8,000 acres of pasture, which are rendered foul and sour on account of flooding and waterlogging.

The photographs here shown may serve to indicate some of the more prominent causes of the deterioration of the lands,

and will certainly point to the necessity for such improvements in the main artery as a drainage board would be empowered to carry out.

The photographs are typical of the condition of a great number of rivers which "drain" large areas of agricultural land in all parts of the country.

The presence of a very serious obstruction (the Aqueduct) on the lower part of the River Lugg affords an instructive illustration of the necessity for the whole of a river being under the jurisdiction of a single authority—any substantial work carried out in the upper reaches would be wasted or harmful unless the water is given a clear run through the Aqueduct. Thus by the removal of the Aqueduct an immediate benefit would be conferred upon the whole of the upper parts of the valley as well as upon the land in the immediate neighbourhood of the Aqueduct itself.

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IN view of the continued rise in the cost of labour and building materials it is becoming increasingly important for County Councils to effect every economy in the **Equipment of Small Holdings.** equipment of small holdings which they are providing in their areas for the settlement of men on the land. There are a number of ways in which expenditure might be reduced and the settler yet enabled to acquire those buildings of which he stands in immediate need, if he is to enter into early possession of his small holding. These were recently outlined in a circular letter addressed by the Ministry to County Councils in England and Wales, and in view of the urgent need for national economy, they should receive careful consideration at the hands of all interested.

While it is not proposed that the minimum standards laid down for cottages should be further reduced, the minimum scale of sizes must be adhered to. The fittings should be as inexpensive as is consistent with durability.

With regard to farm buildings, the Ministry is of opinion that a considerable reduction can be effected without loss to the efficiency of the holdings. Present working requirements need alone be considered, and if these are provided for, the possible requirements of future development may be left over until a fall in prices renders it economically possible to undertake them. Equipment should be restricted to the bare limit necessary to meet immediate needs. Reduction of cost can sometimes be secured by constructing the foundations only of brick, stone or concrete, the material varying with the locality. For the superstructure, home-grown timber covered with elm or deal



FIG. 1.—River Lugg, above the junction of the Lugg and Arrow.



FIG. 2.—River Arrow, near Broadwood Bridge.



FIG. 3.—River Arrow, below Broadwood Bridge.



FIG. 4.—River Arrow, below Broadwood Bridge.



FIG. 5.—River Arrow, near its junction with the Lugg.



FIG. 6.—River Arrow, near its junction with the Lugg.



FIG. 7.—River Lugg (lower portion), above the Aqueduct carrying a derelict canal over the river.



FIG. 8.—River Lugg (lower portion), below the Aqueduct.

weather boarding, the latter preferably creosoted under pressure, is one method which will be found to answer satisfactorily. The roofs may be covered with asbestos, poilite or similar materials, and care should be taken to use only fittings of the simplest design and construction. Adapted army huts, it is true, may in some places prove the cheapest form of farm building obtainable, but a concrete floor must be provided where necessary, and in any case these huts must be placed on a solid base with timbers at least 18 in. above the ground level. On many holdings which do not exceed 10 acres, it is quite enough to provide a rectangular building containing two loose boxes, each about 9 ft. by 13 ft., together with a store shed, 10 ft. by 13 ft. and a loft over all. The tenants will find that this gives sufficient accommodation for their immediate needs. It has often been suggested that if the settlers were supplied with timber at cost price, they would be able themselves to erect smaller buildings such as pigsties and hen-houses. Small Holdings Committees will be the best judges of the ability of applicants to carry out such work for themselves.

The Ministry hopes that Small Holdings Committees will make the maximum use of any equipment which may exist on properties acquired for small holdings. In the present circumstances, it will almost always be found to be more economical to repair old sheds, cow-houses, etc., rather than to erect new buildings.

The Ministry fully appreciates the pride Small Holdings Committees take in equipping their estates in the counties in a model way, and regrets the necessity for pressing on Small Holdings Committees such limitations as those just outlined. There is, however, no other way to meet the present abnormal cost of building which shows no prospect of early reduction, but rather a continual upward tendency. With these facts in view, Committees cannot fail to recognise that the urgent claims of national economy make it of the first importance that the land settlement policy of the Government should be administered with due regard to the minimum capital expenditure.

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EXPERIMENTS have been carried out in recent years in North Wales to ascertain the best method of eradicating bracken from hill land. The results of the experiments are stated in a recent publication of the University College of North Wales, Department of Agriculture.

It has been shown that manuring alone has had no beneficial

effect in the eradication of bracken, but that when combined with regular cuttings of the plant a great improvement has been obtained. The most certain method of dealing with the pest appears to be regular and careful cutting at monthly intervals, commencing in the first week in June, and continuing in the first week of July, August, and September. In this way it has been found that in a few years bracken, even of the strongest growth, will have completely disappeared. Such repeated cuttings, even if not commenced until the beginning of July, have a very great effect. Where this method cannot be carried out the best plan is to cut the bracken each year as soon as it has reached full growth, usually from the beginning to the middle of July. This method, however, will not ensure such complete eradication, or this cannot, at least, be effected until after a longer period. Cutting in August and September has very little effect in most cases unless earlier cuttings have been made.

Unless cutting is commenced at the beginning of June and continued regularly, it is very desirable that the bracken should be removed as soon as the cutting has been performed, as, if left to lie on the ground, the rotting bracken greatly hinders the formation of a firm grazing turf.

* * * * *

DURING the War the export of cattle, sheep and pigs for breeding purposes was restricted to pedigree animals destined for allied and some neutral countries. A

**Export of British
Live Stock.**

licence to export was necessary, but this, practically speaking, did not influence the numbers which left the United Kingdom, although the difficulty in obtaining shipping, high freights and extra risks, doubtless limited the number exported. After the Armistice these restrictions were removed, non-pedigree as well as pedigree animals being allowed to go to allied countries.

Prior to the War the bulk of the live stock exported (apart from horses) went to America—mainly the United States and Argentina—the majority being pedigree animals. In 1913 nearly two-thirds of the cattle and sheep exported were sent across the Atlantic. In 1919, however, the numbers exported to America were less than in the previous five years.

On the other hand, a new trade in non-pedigree animals to Europe arose in 1919, the exports consisting largely of gifts to Belgium, France, and Serbia, purchased through the "Relief of the Allies" fund; and the European Continent would probably have sought to purchase many more dairy animals but

for the adverse rate of exchange and shipping difficulties. In spite of this, however, the European demand is the chief feature of the 1919 trade, the three countries named taking no less than 2,740, or nearly half of the 5,855 cattle exported; while Belgium and France had 3,709 out of a total of 8,593 sheep. Though the number of cattle and sheep exported is thus greater than in 1913, it is probable that there were fewer pedigree animals included amongst them.

The restrictions on the export of non-pedigree animals similarly stopped the trade in old low-priced horses to Belgium and Holland. In 1919 about three-fifths of the exports went to these two countries (5,724 out of 9,057), whereas in 1913 the figure amounted to just 53,775 out of 68,632, or three-quarters of the total. Many of the animals sent to Belgium last year were no doubt bought for re-stocking, but their average value, just under £70 a head in the case of both these countries, is so much below the average to France (£240 per head) or to the rest of the world (£175) as to indicate that they included a certain proportion of aged horses.

* * * * *

RETURNS received by the Ministry of Food disclose a very heavy demand for sugar for domestic fruit preserving, and in view of the limited quantity of sugar available, it will only be possible to meet the demand to a limited extent.

**Sugar for Fruit
Preserving.**

The basis of allotment will be as follows:—

(a) In all cases 2 lb. per head in respect of each member of the applicant's household registered for sugar.

(b) In those cases only where the applicants desire to preserve fruit grown by themselves an additional allotment of 1 lb. of sugar for every 8 lb. of home-grown fruit available for preservation.

Where retailers' customers fail to take up the sugar allotted to them, it can be re-allotted, at the Committee's discretion, either to persons whose applications were late, or to those of the retailers' customers who find that they have more home-grown fruit for preserving than could be dealt with by their original allotment.

Special supplies of sugar for jam making during the coming season will be available for greengrocers, fruit growers, and others who during the year ended 31st December, 1915, manufactured jam in small quantities for retail sale.

Some dissatisfaction has been expressed at the price of 1s. 2d. per lb. fixed for sugar for domestic preserving. For some time past the world price of sugar has been so high that only by purchases made long in advance has the Sugar Commission been able to issue sugar for ordinary domestic consumption to be retailed until recently at the low price of 8d. per lb. Even the present price of 10d. per lb. can be continued only while the supplies purchased before the rise in the world's price remain available. The issue of sugar for domestic preserving at any price lower than an "economic" selling price would, unless world prices fall in the meantime, bring nearer the time when the price of sugar for the domestic ration will again have to be raised. This would be unfair to the large number of people who either do not desire to make jam, or who have no facilities for doing so in their own homes, and who consequently have to purchase their jam at manufacturers' prices. The price of 1s. 2d. per lb. is the retail equivalent of the wholesale price charged to jam manufacturers, and it would be manifestly unfair if sugar were supplied for private jam making at an artificially low price. (*National Food Journal*, 14th April, 1920.)

* * * * *

AN official account of the administrative expenses of the Ministry of Food for the financial year ended 31st March, 1919, is published in the issue of the *National Food Journal* for the 14th April, and contains matter which should be of special interest to farmers.

**Cost of Control of
Food Supplies.**

It is stated that the purchase and re-sale of food stuffs through official channels were undertaken in order to break down the holding-up of produce by those traders who would not consent to sell at a reasonable margin of profit. The close control of distribution to the consumer by compulsory rationing is a very costly venture, and is justified only in grave emergencies such as the nation has recently encountered.

The heaviest portion of the cost has been absorbed in rationing a community of 40,000,000, or about 10,000,000 households, an average cost of 8s. 6d. per household for a whole year. Those whose misfortune it was to endure the misery and discomfort of the queues in the winter of 1917-18 will be the last to complain of a levy of 2d. a week to ensure fair and equitable distribution of the necessities of life.

* * * * *

THE desirability of reimposing the requirements of the Lights (Driving of Animals) Order, 1916,* which was revoked in August last, has recently been considered by a Committee appointed by the Ministry of Transport to consider questions relating to the lights carried on vehicles.†

**Lights when
Driving Animals
at Night.**

The Order in question was made in October, 1916, and required that persons driving or leading animals after dusk should carry a lamp capable of showing a white light both to the front and rear.

While the requirement that a light or lights must be carried with *all* animals on the road at night would no doubt conduce to the safety of driven animals and of motor traffic, the Committee does not consider that it would be practically possible to secure that lights should be carried with all animals upon the highway, owing to the fact that the roads, particularly where they pass through unenclosed and common land, cannot be kept clear of stray animals. Moreover, a requirement that a light is to be carried whenever an animal is driven on a lane or unimportant by-road used almost exclusively by local inhabitants would entail considerable hardship and expense on the agricultural community, without adding materially to the safety of the public.

For these reasons the Committee does not recommend the immediate reimposition of the requirements of the Lights (Driving of Animals) Order, 1916, but is of opinion that the adoption of those requirements on the principal roads of the country should be further considered when such roads have been classified and marked as such.

* * * * * *

On p. 193 are mentioned the proposed new duties on agricultural tractors and locomotives. The proposals are based upon the recommendations of the Departmental Committee on Taxation and Regulation of Road Vehicles. While the recommendations of that Committee and

**New Duties
on Agricultural
Vehicles.**

the proposals of the Chancellor of the Exchequer in regard to motor cars have given rise to acute controversy, there has been little criticism of the new duties on agricultural vehicles. As soon as legislative effect is given to the proposals there should be removed the difficulties and obscurities which have, during the last few years, enveloped the taxation of farm tractors, and local taxation authorities and owners should no longer be troubled over the weight of ploughing engines.

* See this *Journal*, November, 1916, p. 799.

† Cmd. 659, 1920. London: H.M. Stationery Office, 2d. net.

Manuring for Mangolds.—The mangold is one of the most important crops on the farm and one of the most responsive to manuring. The Rothamsted experi-

**Notes on Manures
for June:**

*From the Rothamsted
Experimental Station.*

ments show that it tolerates a higher degree of intensive treatment than any other farm crop, and experience shows that the yield may vary according to treatment from 15 to over 90 tons per acre.

The basis of manuring for mangolds is farmyard manure; this will have been put on in the autumn—always the best plan in the southern parts of England, where mangolds are most commonly grown. In addition, phosphates are necessary to secure adequate root development, and, as many experiments have shown, potash is needed to facilitate the production of sugar. Both phosphates and potash are put into drills. Salt is also necessary—mangolds being originally seaside plants; and finally a liberal allowance of nitrogenous fertiliser should be given, the amount varying with the yield which may be expected. A suitable general dressing was given last month.

It is a mistake to suppose that nitrogenous fertilisers lower the feeding value of the mangold. They of course do harm if wrongly used, but, as a rule, this happens only when insufficient amounts of potash and salt have been applied.

Many experiments have shown that nitrate of soda and nitrate of lime are valuable top dressings, in some cases more effective than sulphate of ammonia. On two soils experiments made by the Midland Agricultural College* (1915) showed the following results:—

				<i>Light Soil.</i>	<i>Heavy Clay</i>
				<i>Tons cwt.</i>	<i>Loam.</i>
					<i>Tons cwt.</i>
No top dressing	..	..	..	20 10	25 18½
Nitrate of soda	..	..	..	29 8½	30 14
Nitrate of lime	..	..	..	28 8	30 4½

In Gloucestershire the results were:—

							<i>(Cirencester.)†</i>
							<i>Calcareous</i>
							<i>Soil.</i>
				<i>1909.</i>	<i>1910.†</i>		<i>Tons cwt.</i>
				<i>Tons cwt.</i>	<i>Tons cwt.</i>		
No top dressing	..	..	..	23 14	28 0	21 19	
Nitrate of soda	..	..	..	29 14	32 4	25 11	
Nitrate of lime	..	..	..	32 5	30 3	25 11	
Sulphate of ammonia	..	..	..	—	30 9	26 1	
Nitrolim	..	..	..	30 6	19 15	25 18	

* *Midland Agric. Coll. Field Trials*, 1915, p. 51.

† *Glos. Repts.*, 1909 and 1910, p. 74, Table I.

‡ *Royal Agric. Coll. Repts.*, Cirencester, 1910, p. 31.

Experiments at the Harper Adams Agricultural College (1910) and at Reading (1907-1909) gave the following yields :—

		<i>Harper Adams.*</i>		<i>Reading.†</i>	
		<i>Loam.</i>		<i>Strong Loam.</i>	
		<i>Tons cwt.</i>		<i>Tons cwt.</i>	
		<i>1909.</i>			
No nitrogen	..	30	19	28	3
Nitrate of Soda	.. (a)	33	18	32	8
Nitrate of lime	.. (b)	40	1	36	17
Sulphate of ammonia	(a)	36	15	—	33
Nitrolim	.. (b)	40	19	—	33

(a) = 1 cwt. per acre.

(b) = 2 cwt. per acre.

The Manuring of Sugar Beet.—The following has been found satisfactory :—

In Autumn or not later than early Spring—10 to 15 loads of farmyard manure if necessary ; a dressing of lime during winter.

In Spring—3 to 4 cwt. superphosphate, or 4 to 5 cwt. basic slag ; $\frac{1}{2}$ to 1 cwt. sulphate of potash, or 2 to 4 cwt. kainit ; 1 to $1\frac{1}{2}$ cwt. sulphate of ammonia.

After Singling— $\frac{1}{2}$ to 1 cwt. nitrate of soda as top dressing.

Sugar beet should be grown on the flat and not on ridges.

Two important points arise in connection with the manuring of potatoes ; the choice of the potassic fertilisers and of the most suitable nitrogenous manure.

It is often supposed that muriate of potash is inferior to sulphate of potash, but the evidence is not very definite. The question formerly possessed little economic interest, because both salts were supplied from the Stassfurt mines and they were both controlled by the same syndicate. It now assumes much greater importance, since muriate of potash comes from Alsace, while sulphate of potash comes from Stassfurt in Germany. More experiments are likely to be made in the near future on the relative effectiveness of these two substances.

There is considerable evidence to show that sulphate of ammonia is distinctly better than other nitrogenous fertilisers for potatoes. The following are some of the experimental results :—

* *Harper Adams Agric. Coll. Rept.*, 1910, p. 33.

† *Reading Univ. Coll. Dept. Agric.*, 1909, Bull. VII., p. 11.

	Woburn, 1909. Sandy Loam.*	Devon. Light Soil.†	Jersey. (Five Centres.)‡	Aberdeen. (Various Centres.)§ 1907-9.
	Tons cwt.	Tons cwt.	lb. per perch.	Tons cwt.
No Nitrogen	14 12	9 18	195	8 6
Sulphate of Ammonia	15 19	12 0	228	9 12
Nitrolim	15 7	12 0	232	8 17
Nitrate of soda	15 9	10 15	221	9 5
Nitrate of lime	15 6	10 7	228	9 6

The Use of Liquid Manure on Seeds Ley.—After the first cut of hay, dairy farmers and others having liquid manure may obtain excellent results by giving a good application of this substance—about 1,500 gal. to the acre.

N.B.—The Notes on Manures will not be published in the June issue of the *Journal*.

* * * * * *

It is satisfactory to note that the downward trend of prices of feeding stuffs continues. Table I. shows the approximate cost per food unit of a number of common feeding stuffs as calculated from the prices which are now included in the Weekly Return of Market Prices issued by the Ministry of Agriculture. Comparison of this table with the similar table given last month shows that in nearly all cases costs per food unit have fallen. This fall in prices has been considerable in the cases of palm kernel cake, coconut cake, dried grains, malt culms, cotton cake, beans, barley, some kinds of foreign oats and peas. It is also satisfactory to note that supplies appear to be adequate, especially as the demand will probably decrease as the season advances and grain becomes plentiful.

Dairy Cows.—In the cases of dairy cows it will usually be necessary to supply cake only to those cows which show signs of scouring when first turned out on the very watery grass which has resulted from the recent continuous wet weather. For this purpose it is advisable to give about 2 lb. per head per day of cotton cake, although this cake at present prices costs about twice as much per food unit as palm kernel cake.

* *Jour. Roy. Agric. Soc.*, 1909, p. 385.

† *Devon County Council Rept.*, 1907-9, p. 6.

‡ *State of Jersey Field Expts.*, 1911, p. 12.

§ *Aberdeen and N. Scotland Coll.*, Leaflet 9, p. 2.

Palm kernel cake is the cheapest concentrated food on the market at present, but although an excellent food for most

TABLE I.—*Costs per Food Unit.*

				s.	d.	s.	d.
Palm kernel cake .. .. .	..	..	..	1	9	—	—
Brewers' grains (wet) .. .. .	..	..	..	1	11	—	—
Palm kernel meal .. .. .	..	..	..	2	1	—	—
Coconut cake .. .. .	..	..	..	2	5	—	—
Ground-nut cake—							
Decorticated .. .. .	..	..	..	2	10	—	—
Undecorticated .. .. .	..	..	..	2	10	—	—
Dried grains, distillers' .. .. .	..	..	..	2	10	—	—
" brewers' .. .. .	..	..	..	2	9	—	3 1
Wheat sharps .. .. .	..	..	..	3	0	—	—
" middlings .. .. .	..	..	..	3	0	—	—
" bran .. .. .	..	..	..	3	10	—	—
Malt culms.. .. .	..	..	..	3	0	—	—
Cotton cake, decorticated .. .. .	..	..	..	3	7	—	—
" meal .. .. .	..	..	..	3	3	—	3 7
" cake, English made .. .. .	..	..	..	3	6	—	3 9
" " Egyptian .. .. .	..	..	..	3	7	—	4 0
Beans, Chinese .. .. .	..	..	..	3	6	—	—
" English .. .. .	..	..	..	4	1	—	4 6
Linseed cake .. .. .	..	..	..	4	2	—	4 4
Maize, Argentine .. .. .	..	..	..	3	8	—	4 4
" American .. .. .	..	..	..	4	9	—	—
" meal .. .. .	..	..	..	4	9	—	5 0
Barley, English feeding .. .. .	..	..	..	4	7	—	5 4
Oats, English .. .. .	..	..	..	5	4	—	5 7
" foreign .. .. .	..	..	..	4	6	—	5 4
Peas, various .. .. .	..	..	..	4	1	—	6 0

purposes it does not possess the astringent properties of cotton cake which make the latter so valuable for correcting the scouring tendency of watery grass or roots. As a rule it is only necessary to continue the cotton cake ration for quite a short time. It may safely be discontinued as soon as the cows have become accustomed to the grass.

On the general question of the use of concentrated feeding stuffs for dairy cows on grass, readers are advised to refer to a paper in this *Journal* for April, 1918, p. 11. In this paper are described experiments which show quite conclusively that in normal seasons it is unprofitable to use concentrated food for dairy cows in the early months of the grazing season, until in fact the latter half of July, when the grass may begin to fail in quantity and quality.

For dairy cows kept under town or suburban conditions, where grass is not available, the ration should at present prices include a large proportion of palm kernel cake. Other suitable

concentrates for this purpose are coconut cake, ground-nut cake and millers' offals.

Sheep.—Palm kernel cake will also be found useful and economical for sheep, and for this purpose it may be mixed with ground-nut cake and dried grains, which have fallen considerably in price since last month.

Horses.—For horses oats are still extremely expensive, costing about 5s. per food unit. Oats may be replaced economically by one or other or a mixture of the following concentrates :—maize or beans at about 4s. per food unit ; bran at about 3s. 10d. ; sharps at about 3s. ; dried grains at about 3s. Palm kernel cake at about 1s. 9d. may also be used, but of this latter the writer has no personal experience. It is, however, so much cheaper than anything else that it is certainly worth a trial.

The most common cause of trouble in substituting other concentrates for oats is the lack of knowledge of the quantity of other foods equivalent to 1 lb. of oats. For instance, 1 lb. of oats is equivalent to $1\frac{1}{4}$ lb. of bran. Usually when bran is used to replace oats the replacement is made weight for weight, and the horses are consequently underfed. With maize the mistake is in the opposite direction—1 lb. of oats is equivalent in food value to $\frac{3}{4}$ lb. maize. If 1 lb. of maize is substituted for 1 lb. of oats, the horses are overfed. They become fat and often develop trouble in their feet.

Of the foods quoted above the following quantities are required to replace 1 lb. of oats :—Maize, $\frac{3}{4}$ lb. ; beans, 14 oz. ; bran, $1\frac{1}{4}$ lb. ; sharps, 14 oz. ; dried grains, $1\frac{1}{4}$ lb. ; palm kernel cake, $\frac{3}{4}$ lb. If substitution is made in these proportions, and the mixture is so arranged as to be palatable to the horses, trouble is not likely to occur. The following instance will illustrate the method :—

To replace 12 lb. oats, costing at present prices 2s. 2d.—

4 lb. oats	=	4 lb. oats	cost $8\frac{1}{2}d.$
$2 \times 1\frac{1}{4}$ lb. bran ..	=	$2\frac{1}{2}$ lb. bran	„ $3\frac{1}{2}$
2×14 oz. sharps ..	=	$1\frac{3}{4}$ „ sharps	„ $2\frac{1}{2}$
$2 \times \frac{3}{4}$ lb. palm cake ..	=	$1\frac{1}{2}$ „ palm cake kernel ..	„ $1\frac{1}{2}$
$2 \times \frac{3}{4}$ lb. maize ..	=	$1\frac{1}{2}$ „ maize	„ $3\frac{1}{2}$
<hr/>			
12 lb. oats	=	$11\frac{1}{4}$ „ mixture ..	cost 1s. $7\frac{1}{2}$

A mixture of this kind will maintain horses at work satisfactorily and will cost only 1s. $7\frac{1}{2}d.$ for a full day's ration, instead of 2s. 2d. if the ration were entirely composed of oats.

TABLE II.—*Feeding Value of Common Feeding Stuffs.*

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Name of Feeding Stuff.	Nutritive Ratio.	Per cent. digestible.			Digestible Food Units per ton.	Starch equiv. per 100 lb.	Linseed Cake equiv. per 100 lb.
		Protein.	Fat.	Carbo-hydrates and Fibre.			
Foods Rich in both Protein and Oil or Fat.							
Ground nut cake ..	1:0.9	42.0	6.8	20.2	133	73	99
Soya bean cake ..	1:1.1	38.2	6.4	23.6	126	69	93
Decort. cotton cake ..	1:1.2	34.6	9.3	19.4	120	71	95
Linseed cake, Indian	1:2.0	27.8	9.1	30.1	115	74	101
Linseed cake, English	1:2.2	25.3	8.7	33.0	111	74	100
Cotton cake, Egyptian	1:2.0	17.6	5.1	22.0	74	42	56
Cotton cake, Bombay	1:2.3	15.6	4.5	23.3	69	40	54
Distillers' grains ..	1:2.9	19.6	10.2	30.1	99	57	77
Maize gluten feed ..	1:3.1	20.0	2.7	51.8	104	76	102
Brewers' grains, dried	1:3.8	13.0	5.6	34.9	77	48	65
Coconut cake ..	1:4.0	16.2	9.6	41.4	100	79	107
Palm kernel cake ..	1:3.7	17.1	6.8	43.6	98	75	101
Linseed ..	1:5.5	19.4	34.7	20.1	144	119	161
Bombay cotton seed ...	1:6.2	12.3	16.8	30.2	97	74	100
Fairly Rich in Protein, Rich in Oil.							
Maize germ meal ..	1:7.6	0.4	12.8	48.3	102	85	115
Rice meal ..	1:10.2	7.5	11.6	40.6	84	72	97
Rich in Protein, Poor in Oil.							
Fish meal ..	1:0.2	50.0	4.2	—	125	53	71
Peas, Calcutta white ..	1:2.1	23.3	1.1	45.9	97	70	94
Beans, English ..	1:2.6	20.1	1.2	48.2	97	66	89
Beans, Chinese ..	1:2.6	19.6	1.7	47.9	101	67	91
Peas, English maple ..	1:3.2	19.4	1.0	52.4	99	69	93
Palm-nut meal (ex- tracted) ..	1:3.5	17.1	1.9	51.5	95	71	96
Brewers' grains, wet ..	1:3.3	5.5	2.4	11.5	30	18	25
Malt culms ..	1:3.9	19.9	1.5	43.6	88	43	59
Cereals, Rich in Starch, not Rich in Protein or Oil.							
Barley, feeding ..	1:11.4	6.5	1.2	64.7	82	71	96
Oats, English ..	1:7.9	8.0	4.0	47.4	75	59	80
Oats, Argentine ..	1:7.9	8.0	4.0	47.4	75	59	80
Maize, American ..	1:11.5	7.1	4.5	65.8	92	81	110
Maize, Argentine ..	1:11.3	7.1	4.5	65.8	92	81	110
Maize meal ..	1:14.6	5.5	3.5	64.8	85	78	105
Wheat middlings ..	1:4.6	13.2	3.0	53.8	91	72	97
Wheat sharps ..	1:4.4	13.8	4.3	50.5	92	64	86
Wheat pollards ..	1:5.2	11.6	4.0	51.6	87	60	81
Wheat bran ..	1:4.5	10.6	2.8	40.8	72	45	61
Wheat bran, broad ..	1:4.5	10.6	2.8	40.8	72	45	61
Locust bean meal ..	1:22.1	4.0	0.7	69.2	80	71	96

Figs.—On the subject of pig feeding, readers are advised to refer to three papers in this *Journal* for October, 1917, p. 721; November, 1917, p. 826; and April, 1918, p. 21. In these papers Messrs. Mackenzie and Fleming give their experience of feeding sows, piglings and hogs on roots, grass, potatoes and other succulent foods, their ration of concentrates consisting largely of palm kernel cake. At present prices the information contained in these papers is very much to the point.

N.B.—The Notes on Feeding Stuffs will not be published in the June issue of the *Journal*.

FARMING ON BRECK-LAND IN NORFOLK.

S. L. BENSUSAN.

EAST ANGLIA holds some 200,000 acres of what is known in Norfolk as breck-land, Norfolk's own contribution being some 80,000 acres or thereabout. It is part of the lightest soil in the country, and commanded in pre-war times a merely nominal rent—five, six or seven shillings per acre being deemed sufficient for soil that could apparently raise little more than gorse, bracken and rabbits. Men hired, but made little or no attempt to farm it. Their rent and rates were covered by the shooting rights, for, in addition to providing rabbits as the sand upon the sea shore for multitude, there were very many hares and a fairly good head of partridges. The writer remembers taking part in a hare drive on Suffolk breck-land a few years ago, when in the course of one day 585 hares fell to 12 guns. There could be little incentive to farm land that, if it could grow a crop, would be likely to yield it when young and green to thousands of hungry intruders.

One of the chief owners of this breck-land in Norfolk is the Duchy of Lancaster, and in 1914, a few months before the War, the Development Commission took over some 200 acres from the Duchy and started to reclaim it, thereby adding not only to the fertility of England as a whole but to the amusement of the East Anglian farmers as a class. Though the outlay on reclamation was no more than £5 an acre, it came near to doubling the cost of the land. The whole question then remaining to be solved was whether scientific farming, applied to a seemingly hopeless proposition, could result in anything better than a heavy loss.

It is not necessary to be a practical farmer to realise that the breck-land, of which the Ministry of Agriculture's Experimental Farm at Methwold in Norfolk consists, is the poorest of the poor. It absorbs instantly whatever moisture is forthcoming, and if an hour after a heavy shower you kick the soil it protests in a little shower of sand. To make the farming proposition still less productive a spring drought has often to be expected; some of the land bakes very readily, there are many hot patches, and in places the plough limit is not more than seven to eight inches. It is not surprising in these circumstances that land like Methwold has been left lightly farmed for so long, or that its potentialities have not been realised. Yet even before the War it was recognised that no good purpose can

be served by surrendering land to hares and rabbits, bracken and gorse. Even if the peace of the world had not been broken the experiment at Methwold would still have been carried through, though the need for it would not have been as urgent as it was destined to become.

The first effort at improvement was to apply chalk very liberally; the application being 7 tons to the acre. A heavy initial dressing of basic slag and potash salts was also applied, and for each subsequent crop some artificial fertiliser was used. Potash is the "missing word" on this kind of soil; without potash no remunerative crops can be grown. While it was found that crops were nowhere heavy, the cost of production was nowhere high, because after the first reclamation the land became very easy to work. The price of wheat cultivation per acre is probably the lowest in England. Steam cultivators were used for reclamation. They were followed by motor tractors and horses. After that it was found that the motor plough could cover as much as 4 acres in a day, and that owing to the lightness of the soil it is possible for horses to work on the land for an average of more than 220 days in the year.

The difficulties have not arisen altogether from the nature of the soil. The increase of wages from 16s. in 1914 to £2 2s. 6d. in April, 1920, presents a serious problem enough, and this advance in cost of production has not been associated with a corresponding increase in efficiency. The reverse is the case. The young men, at least, are quick to leave the fields if there is a local fair or an entertainment a few miles away from their work, and they turn with distinct aversion from overtime. In spite of all the difficulties, it is clear that we have in the breck-lands a fair farming proposition, though whether it can be maintained in the face of rising wages and falling output of work done is a question that only time can solve. Down to the present, upwards of $3\frac{1}{2}$ coombs of wheat have been the average yield per acre. Potatoes yield nearly 4 tons, or as much as is obtained on some of the heavy clay lands in Essex. Blue peas (Harrison's Glory) yield an average of $4\frac{1}{2}$ sacks to the acre, while as many as 10 tons of eating carrots have been sold off one acre, leaving a residue of the inferior kind to be fed to stock. Bullocks appear to thrive on a mixture of these unmarketable residues mixed with chaff. The yield of mangolds, 10 to 12 tons per acre, is admittedly poor, but breck-land is not mangold land and the crop is only sown to meet the necessities of the stock-yard, and may be abandoned altogether on account of the cost of labour. White turnips do extremely

well and the sheep folded on them thrive. One-year leys are successful and lucerne will last between 4 and 5 years.

The success of the experiment on 200 acres, in the face of difficulties that might well have seemed overwhelming, and in the face of tradition that might well have appeared inviolable, led the Ministry in October of last year to purchase a further 1,300 acres of land, owned also by the Duchy of Lancaster, and rather worse, if possible, than the first lot. It is part of what was formerly a large single estate, but the land has been allowed to run out; the hedges are overgrown and practically worthless; the soil is deficient in potash, and before attempting to sow corn it has been found necessary to grow green crops and fold sheep on them. Yet even with this unpromising land there is ample material for experiment and not a little prospect of success. For example, it was realised at once that here was soil suitable for experiments in open-air pig keeping. There is nothing to fear from excess of moisture; there are plantations of larch and pine together with great expanses of bracken, so that all the material for rough shelters and bedding is to hand. In a little while the houses will be set up and the pigs will be taking their chance.

Another side-line is tobacco, to which 10 acres have been allotted for the present year, with a further 20 to follow in 1921. For the preparation of tobacco it is necessary to raise the seed in frames heated by hot water pipes. This work is done in March, and the plants are set out in the open in May, but as frames were not available in time on the Methwold farm, the seed has been raised at Brandon, and is being planted out from there. Already drying-sheds and rehandling houses are in building and will be finished in time for this year's crop.

A further experiment for which preparations are now being made is arable dairy farming on the method originated at the Harper Adams College, Newport, Shropshire. It is hoped to start the dairy during the summer.

Yet another undertaking, which should be in operation by the time these lines are printed, is the poultry farm for disabled ex-soldiers, a feature of the Ministry's farm settlements. Buildings were already erected in April, the incubators were installed and the instructor was in charge. It is proposed to give the men who go to this branch of the Methwold establishment a year's training, to include some horticultural work, as the advisability of adding something to poultry farming as a means of livelihood has been very properly recognised.

Stock appears to do well. Lincoln Red cattle may be seen in good condition in the yards. The Large White pig has been chosen and apparently justifies the choice, and the best sheep on the farm are a cross between Suffolk ewes and Cotswold rams.

The Methwold Experimental Farm may claim to be considerably more than a venture that promises to return interest upon capital, and to afford a considerable measure of useful employment. It is a practical demonstration of the abundant possibilities possessed by a corner of England that has long lain derelict and has been regarded as a proposition that will never repay high farming. Evidence is already forthcoming that neighbouring farmers are keenly interested in the various experiments, and many of those who came to scoff, remained to praise—and in some cases went home to imitate.

THE ACCOUNTS OF A HAMPSHIRE FLOCK IN 1918-19.

Sir DANIEL HALL, K.C.B., F.R.S.,

*Director-General, Intelligence Department, Ministry of Agriculture
and Fisheries.*

THE Hampshire pedigree flock of 281 ewes, of which the following accounts are set out, is the property of the Lord Wandsworth Institution, and is kept on their Long Sutton Estate near Winchfield, Hants. The land in cultivation extends to about 700 acres, charged at an average rent of 20s. an acre, but less on the fields with which the present account is concerned. The land is comparatively high, mostly above 500 ft., and is a mixture of light loam and chalk and the heavier flinty soils which so generally rest upon the Downs. The flock was formed in 1915 by Mr. E. J. Bennett, of Chilmark. The foundation ewes were obtained from Mr. W. C. Young, of Stratford-sub-Castle, the late Mr. Coles, of Winterbourne Stoke, and Mr. B. Nichols, of Burntwood, Winchester. Rams have been bought from J. Fleming, D. Nichols, E. B. Blackwell and J. Ismay.

The season 1918-19 was not a good one for sheep in this district owing to the shortage of keep throughout 1918. In consequence the ewes were not in the best of condition at lambing time, and 2 of them died before lambing and 20 during the early summer. Lambing was on the whole late, and the persistent wet weather in the early part of 1919 was unfavourable both for lambs and ewes, with the result that the ram lambs were hardly forward enough for the summer sales and shows. The 279 ewes in the flock at lambing time reared 278 lambs only, of which 5 died subsequently.

The flock obtained H.C. for a pair of ram lambs and for a single lamb at the Cardiff Show of the Royal Agricultural Society and also H.C. and Reserve for a shearling ram.

The flock was kept in the usual manner and was folded throughout the winter upon turnips and a mixture of swedes and kale, and throughout the spring and early summer upon vetches and oats; fair crops in either case.

The accounts are kept upon the costs basis. The valuation of the ewes is preserved from year to year at a fixed figure of £4 per head on the 1st May, and they are carried forward at the closing of the account on 11th October at this figure of £4 plus the cost of their keep during the summer, plus the cost

of the rams that had been used for service during that period. The cost of any rams bought during the year is spread over two years, after which the rams are written down to a fixed figure of £7 as long as they remain in the flock. The accounts are set out below. The valuation of the flock shows little change during the year, but at the end of the time there were 46 fewer ewes and 51 fewer ewe tegs. The reduction in numbers of the flock was due to the sale of 26 draft ewes which had not been sold by 11th October, 1918, and to a further weeding out in 1919 in order to make room for 40 newly purchased ewes which have not been brought into the account. The fact that the total valuation of the flock had been little reduced as compared with this considerable reduction in its numbers implies that the ewes were carried forward at the end of the year at a higher figure per head. The costs of keeping the sheep during the six summer months had been much greater in 1919 than in 1918, and the valuation is made up of the fixed figure of £4 for the ewes together with their costs from May to October.

The crops consumed are charged on the basis of two-thirds of the cost of cultivation and the full cost of the seed, though the manures are carried forward to the succeeding corn crops. The grazing land, which is mainly indifferent upland pasture, is charged at its actual cost, since it was put to no other purpose. The hay, oats, and beans consumed, which were produced on the farm, were charged at market prices. It may be urged that there is a profit to the farm concealed in these charges, but inasmuch as there was a market for these materials, and in their place other foods would have had to be purchased, it is necessary to take them into the account at market prices in order to ascertain the profit or loss on the flock considered alone. We are in fact using the accounts to determine whether it is more profitable to keep the flock or put the land to other uses, *e.g.*, corn growing, as many flock owners have done. One other item in expenditure may seem very large; the general expenses, including management, which amount to £256. This item, however, is arrived at by dividing the general expenditure upon the farm, which cannot be allocated, in proportion to the outlay upon the labour for each department. It does, however, appear to fall somewhat heavily upon the corn land.

On the receipt side the ram lambs, upon the sale of which the success of the pedigree flock largely depends, did not do as well as they ought, because, as has been noted above, the flock is young and in this year the lambs were late. One ram was

let for the season for 170 guineas, another was sold for 50 guineas, a shearling was sold at 50 guineas and another shearling at 45 guineas, and the general average made by the ram lambs amounted to about 15 guineas a head. The fat sheep and lambs were sold under control in the ordinary way and realised an average of about 73s. a head, lambs in August and September making about 62s. each. The wool was sold at 2s. 8½*d.* per lb. The general result is a loss for the year of over £300, to which must be added some loss in the valuation for reasons indicated above. This loss is undoubtedly due to the great expenses which now attend an arable land flock. Nearly £500 was spent directly upon labour apart from the labour spent on growing the crops folded off. Of course this cost is much higher than a normal flock would require, because a pedigree flock requires a shepherd at a special rate and other extra attentions. The biggest item, however, in the costs is the food. The dry foods consumed amounted to £1,360, less a credit for £335 for manurial residues. The crops folded off were also expensive in view of the high cost of seed and labour. Dividing all the expenses on the basis of the number of ewes in the flock, and that is the only fixed datum, the ewe with its lamb throughout the year costs about £5 15s. for food, 26s. for labour, 17s. for service of the rams used, and 27s. management and sundries, roughly £9 5s. a head, against which about 22s. can be set off for wool, rendering it necessary to realise an average of £8 3s. per head for the lambs, both ewes and rams, on the basis of one lamb per ewe. When it is considered that half the fall of lambs will be ewes, and that of the ram lambs only a proportion can be sold for stud purposes, while the rest, together with the ewe lambs and cast ewes sold, only realise 73s. per head, a very high figure must be obtained for the stud ram lambs in order to make the flock pay. In the assumption that 100 per cent. of lambs are reared in addition to such ewe lambs as are required to replace ewes dying during the year, and that 60 per cent. of the ram lambs are fit for sale for stud purposes, these latter would have to realise an average of £17 a head in order to make the flock pay its way.

Putting aside certain particular and seasonal sources of loss, such as the poor fall of lambs, the bad season, and the fact that the flock has not been established long enough to secure the position in the market to which it might be considered entitled from its breed, there are certain more general sources of loss which affect all similar flocks. In the first place, though the prices realised by pedigree stock at the present time look

very handsome, they have by no means increased in proportion to the costs of raising and managing the flock. The costs have certainly been trebled, but the increase in the average price of pedigree stock, great as it is, has been by no means on that scale. The stock sold for breeding, however, though one of the largest items in the receipts, by no means accounts for all the return, and a considerable part of the income of a flock is that derived from the lambs not fit for breeding and the cast ewes.

This is the only source of income in an ordinary flock that does not sell rams, and has as regards arable sheep been most adversely affected by the operations of control. It may be agreed that a flat price for mutton and lamb was inevitable under control, but it has borne very hardly upon sheep of the Hampshire class, indeed upon all the Down breeds. Breeders have relied for their income very largely upon the sale of lamb, from which they derived a special price in consideration of the time at which it is produced and the heavy artificial feeding involved. All these advantages have disappeared. The Hampshire lambs ready for market from May onwards have been selling at 10s. 9d. per stone, making about 60s. a head under control, as compared with about 7s. a stone or 40s. a head in the days before the War.

When one considers that the costs of production have at least trebled the reason for the losses in connection with a flock like this is evident. The mutton, sheep and lambs of this flock have averaged not more than 73s. a head, a figure which is quite inadequate as compared with the costs of production. Moreover, this failure to realise the proper price for lamb has re-acted upon the price for ram lambs. All the arable-land sheep have been hard hit and have seriously diminished in numbers during the period of control. Between 1913 and 1919 the average numbers of sheep in the country have fallen by 11·7 per cent., but this loss has fallen almost entirely upon the sheep on arable land, whereas the grass sheep have pretty well maintained their numbers. For example, Hampshire in 1913 contained 266,231 sheep, in 1919 165,657, a fall of 37·8 per cent., whereas during the same period in Cardigan, a county of grass-land sheep only, the numbers actually increased. The map which is here reproduced shows by its shading the changes in the sheep population of each county of England and Wales during the war period. It will be observed that the losses in the numbers of sheep are comparatively small over the western and southern parts of the country where grass sheep are mainly kept, but that they are very great in the arable counties in the east of England and



— REFERENCE —

Increases..... shewn thus.. +	Decreases from...21%..to..25% shewn thus..
Decreases down.....to..5%..... -	.....26%.....30%.....
..... from 6% ..10%.....	.....31%.....35%.....
.....11%.....15%.....	.....above.....36%.....
.....16%.....20%.....	

Map showing the Increase or Decrease per cent. in the number of Sheep in 1919 as compared with 1913 in each county of England and Wales.

are at their highest in Wiltshire, Hampshire, West Sussex and Suffolk. The actual maxima of decline occur in the Isle of Ely and Holland (Lincoln), but the numbers of sheep there kept are comparatively small. It is, in fact, the sheep on arable land that have been reduced by the operations of control. The costs of keeping these sheep have increased enormously because they have to bear the heavy labour costs involved in folding and in the growth of green crops upon which the flock is fed. At the same time the receipts have not been enhanced in the same proportion because flock-owners have not been able to obtain the higher prices for lamb as compared with mutton upon which the financial success of the Down flocks depended in the past.

No separate statistics are available of particular breeds, but it is obvious from a consideration of these figures that breeds like the Hampshire Downs, the South Downs, the Oxfords and the Suffolks must have lost something like half their numbers during the later years of the War, when control of meat prices existed. This diminution in numbers can be set down to the enhanced cost of production, the unremunerative price of lamb and the temptation held out to the flock-owner to realise his ewes and to sell his hay at the high prices that have been prevailing for that commodity, while at the same time he could, for a time at any rate, grow profitable corn crops in place of the unremunerative fodder crops formerly grown for the flock. The general decline that was going on in the numbers of arable land sheep has further reacted unfavourably upon the market for ram lambs, the demand for which on a flock of the type described has naturally fallen when so many of the non-pedigree commercial flocks were being given up. It is clear that until the market resumes a more normal condition and early lamb obtains a price commensurate with its cost of production, the folding of sheep upon the arable land will continue to be unremunerative. Were the present range of prices to continue it would be necessary to effect a complete change in the farming system that has hitherto prevailed upon the chalk areas, for that system is essentially based upon the consumption of green crops upon half the arable area as the best preparation for the succeeding corn crops.

The accounts further illustrate the unremunerative character of pedigree stock breeding in the early years before the name of the herd or flock has been made. The quality of the produce may be undeniable, but a place in the charmed circle of big prices depends very much upon the personal skill and advertising art of the owner.

THE LORD WANDSWORTH INSTITUTION.

Hampshire Down Sheep Account.—11th October, 1918—11th October, 1919.

1918.—11th October				1919.			
To Capital Account—				By Ram Lambs Sold (158)			
281 Flock Ewes at £4	..	1,124	0 0	(1 Let, 170 gs.; 1 Sold, 50 gs.)	..	..	..
26 Draft Ewes unsold at £4	..	104	0 0	Fat Sheep, Cast Ewes and Lambs (304)	..	..	..
2 Rams	..	189	0 0	Shearlings (14)	..	..	..
2 " at £7 each	..	14	0 0	(1 Sold, 50 gs.; 1, £45)	..	..	..
Keep of above, 1st May to 11th October	..	651	0 10	Wool	..	..	..
14 Ram Lambs (bred) at cost	..	164	13 6	Manurial Residues	..	..	..
120 Ewe Tegs (bred) at cost	..	566	2 0	Sundries	..	..	..
				Valuation—	..	..	..
				261 Ewes at £4, plus £210 (Purchase and Hire of 2 Ram Lambs), and Cost of Keep;	..	..	..
Labour	..		2,812 16 4	4 Rams at £7, plus Cost of Keep;	..	..	..
Horse Labour	..		405 13 5	20 Ram Lambs (bred), at Cost;	..	..	..
Purchased Foods Consumed	..		88 4 6	69 Ewe Lambs	..	..	..
Crops Consumed	..		662 8 9	Loss	..	..	..
(Average Cost per Acre—			673 16 7				
Mangolds	..	16	7 7				
Turnips, Swedes, Kale	..	7	18 3				
Vetches	..	3	16 8				
Fields Grazed	..		74 9 0				
(Average Cost per Acre)	..	1	4 1				
Hay Consumed (at Market Price), £7 15s., plus Labour	..		402 16 3				
Oats, Beans Consumed (at Market Price), plus Labour	..		295 7 2				
Sundries	..		161 11 9				
General Expenses, including Management	..		256 3 5				
Ram Lamb Purchased	..		157 10 0				
" " Hired	..		52 10 0				
			£0,043 7 2				

OUR NATIONAL FOOD SUPPLY :

LIMITS OF SELF SUPPORT.

THE following notes are an abstract of the first of three Chadwick Lectures delivered at the Royal Sanitary Institute by SIR DANIEL HALL, K.C.B., F.R.S., :—

It is well known that of late years the United Kingdom has been very largely dependent upon imported food to maintain its population. To what extent do we feed ourselves? In order to obtain comparable figures it is necessary to reduce all foods to a common standard. Mere weight will not compare bacon with bread or eggs with milk. The common standard we require is obtained by ascertaining the value of the food as fuel to keep the machine of the body running. The body behaves like a machine ; it takes in food just as an engine requires coal, and the more work the body does the more fuel must be burnt up in it. Scientific men, therefore, value food in units called calories, which measure the value of the food as a means of doing work. There are other elements in food to be considered, particularly the protein content, protein being required to repair the waste of the tissues. But in an ordinary mixed diet if the calories are sufficient to keep the machine running the food will also supply enough protein. A man doing light work will want about 3,000 calories a day.

Towards the end of 1916, when the question of the nation's food supply began to be urgent, a Committee of the Royal Society summed up the diet of the nation for the five-year period prior to the War, and according to its figures in those years the total food supply consumed would have supplied each man, woman and child in the United Kingdom with 3,091 calories a day.* Only about 42 per cent., however, of this food was produced within the United Kingdom. Of the most important elements in the food of the country, *i.e.*, bread, only one-fifth was produced at home, but something like 60 per cent. of the meat and nearly all the potatoes were grown here.

How did we get into this dangerous position? At the beginning of the Nineteenth Century the country was practically self-supporting, but the growth of population had altogether outstripped the increased productivity of the land. Moreover, for the period of forty years before the War the productivity of the land had been steadily declining owing to

* See this *Journal*, February, 1917, p. 1046.

changes in agriculture. From the productivity point of view 1872 represents about the high-water mark of British farming. At that time in England and Wales there were nearly 15,000,000 acres under the plough ; by 1914 that figure had fallen to less than 11,000,000—by 26 per cent.—and the wheat acreage had dropped from 3,500,000 to about 1,800,000. Nearly 4,000,000 acres of land had been put down to grass, and carried cattle and milch cows instead of growing crops.

From the point of view of food supply, the meat and milk produce from grass land do not make up for the crops that might otherwise have been grown. This is a cardinal factor to bear in mind in connection with the national food supply.

Grass land is comparatively unproductive of food as compared with arable land. There are two reasons for this. In the first place, on the uncultivated grass land there is actually a smaller production even of cattle food. On average land three times as much cattle food can be grown as would be produced by the uncultivated grass land upon a similar area. Secondly, the production of meat, milk and all animal products involves a great loss of absolute food. The animal is an indifferent converter of the material grown by the land. The pig is the best converter amongst animals, but even a pig will consume 7 lb. of barley meal in order to produce a pound of pork, and the pound of pork does not contain as much human food as the pound of meal. Of course the cattle can utilise a great many coarse fodders and waste produce which are unsuitable for human consumption. But none the less they are consumers of the products of land which might have been growing something like ten times as much human food of a vegetable character.

When a population is driven to subsist on or near the minimum it must become increasingly vegetarian in its diet.

Amongst the animals the pig is the best converter ; milch cows come next, then sheep, while the manufacture of beef is the most wasteful of all.

The superior power of arable land to maintain human beings is illustrated by Sir Thomas Middleton's calculation that 100 acres of arable land in this country is normally producing food that will maintain 84 persons, whereas the same 100 acres under grass is only maintaining from 15 to 20 persons.*

In the face of these facts, why not at once put all the land under the plough ? That was the line of policy of the Food Produc-

* This subject was dealt with in an article " Farming in the United Kingdom in Peace and War: the Plough Policy and its Results," by Sir Thomas Middleton ; see this *Journal*, March, 1920, p. 1192.

tion Department during the War, and they had succeeded in 1917-18 in adding 1,150,000 acres to the area under the plough.

The difficulty then was the lack of labour, horses, implements and buildings, and the same difficulty faces us now, when it is still the prime national interest to make our own land produce as much as possible and buy as little as we can from abroad.

The crux of the question is the amount of labour that arable land requires, and its increasing cost. It was this factor which above all others drove the land down to grass during the last 30 years of the Nineteenth Century. The value of the produce of arable land was constantly falling until there was not enough to pay for the cost of labour. Roughly speaking, 100 acres of arable land require the labour of four men, whereas 100 acres of grass land will want at the most two men if milk is being produced, and only half a man or less if cattle and sheep are being grazed. The difficulty before the farmer that causes him to hang back from increasing his arable area at the present time is that the costs of labour have risen disproportionately to the price of his produce. Before the War a farmer growing an acre of wheat would get about £7 for the produce, out of which he had to pay about 30s. for manual and 15s. for horse labour. At the present time that 30s. has become 100s., the 15s., 30s., whereas the 140s. has only become about 280s. Even if his rent has not risen, the margin of profit can be no higher than it was before, whereas the risks are of course very much greater. By comparison the grass land is a much more tempting proposition. On the grass land the labour only amounts to 10 per cent. of the value of the produce instead of 30 per cent., or rather 45 per cent. including the horses, as it does on the arable land. The available margin of profit when the value of the produce has doubled is, therefore, much more tempting than it was before. The chief factor of cost in grass land farming is the rent of the land, and that has increased but little. Labour is the chief factor of cost of arable land, and that has trebled in cost. There is still a greater profit to be obtained from arable land, but it is more speculative, harder work, and demands more skill and enterprise on the part of the farmer. Much as the nation needs arable land, in the present uncertain conditions of prices and labour, the farmer will be tempted towards grass land as long as the prices of corn, which is the chief produce of arable land, are kept down. Land in England is cheaper, especially rented land, than land in any other part of the world, and this of itself is an inducement to farm under grass.

One is often asked whether the United Kingdom could become self-supporting in the matter of food. It is, perhaps, rather an academic question, because the question of cost and profit will always dominate the situation. However, I have calculated what an acre of arable land, suitably distributed, could be made to yield of the main items of necessary food. From the table opposite it will be seen that on an acre of arable land, assuming the average yield of the arable land of to-day, one person could be maintained for a year. We have a population of 45·3 millions, and 46·1 million acres of cultivated land, grass and arable, in the United Kingdom. We might think, therefore, we could maintain our population and give individuals the same number of calories as they were getting before the War. They would have to eat a little less meat and a little more vegetables, but the diet would be a perfectly healthy one. This calculation, however, assumes that all the land of the country could be made to yield as well as the present fraction that is under the plough. This fraction, however, comprises by far the best land, and with all the improvements that we can consider possible in farming we could not make the whole area yield as well as the current arable land. The calculation also assumes that in the production of meat and milk, theoretically perfect use is made of the cattle food, whereas, in practice, before the War the country used something like three times as much cattle food as would be necessary for the theoretical output of meat and milk. Again, the calculation assumes that all the land is devoted to feeding human beings, whereas at the present time it has to support in addition the horses, both those wanted on the farms and those at work in the towns. Thus the table I have given you is a curiosity only and has little bearing upon what we may reasonably expect.

All the same the food crisis is not over, and we must turn over to a much greater extent to arable farming. Quite apart from question of price there will not be in future the same margin of food in the world for importation that there was before the War. Everywhere there has been a great withdrawal of labour from the land, and this will be seen year by year in a diminution in the total food supply. Moreover, the United Kingdom is fundamentally and without disguise very much poorer than it was before the War and cannot purchase as it did once in the common markets of the world. These factors will force us to grow more of our own food and to pay the prices necessary to make the arable farming, by which land this greater production

can be assured, profitable to the cultivator of the soil. At the same time the great bulk of the population will have to change its habits with regard to food and meet the higher prices by a great proportional consumption of those articles of food which are essentially the cheapest. That means, in the first place, an increased consumption of bread, potatoes and vegetables instead of meat. Amongst the animal products, milk and milk products are cheaper foods than meat. Pork will have increasingly to replace other meats, and beef, especially the prime beef of which our farmers were so proud, will become an expensive luxury.

Theoretical Produce from an Acre of Arable Land as compared with the pre-war Consumption of a Unit of the Population of the United Kingdom.

Parts.	Items.	Yield per Day.		Pre-war Diet per Day.	
		Amount.	Calories.	Amount.	Calories.
8	Wheat, $\frac{1}{5}$ th acre	18 oz. bread	1,360	{ $\frac{3}{4}$ lb. bread	1,067
	„ offals	$\frac{1}{4}$ oz. bacon	42	{ $1\frac{1}{2}$ oz. cereals	
10	Milk, $\frac{1}{4}$ acre	$\frac{1}{2}$ pint milk	203	„ $\frac{1}{5}$ th oz. bacon	134
	„ „	1 oz. butter	200	„ $\frac{1}{2}$ pint milk	194
	„ „			1 oz. butter,	198
	„ „	$\frac{1}{2}$ oz. cheese	64	„ marg., and lard	
1	Potatoes, $\frac{1}{40}$ th ac.	1 lb.	250	„ $\frac{1}{4}$ oz. cheese	35
2	Vegetables and Fruit, $\frac{1}{20}$ th acre	2 lb.	240	„ 1 lb.	241
1	Sugar Beet, $\frac{1}{40}$ th acre	4 oz. sugar	465	„ 1 lb.	114
18	Meat, $\frac{9}{40}$ th acre	$4\frac{1}{2}$ oz.	337	„ $3\frac{1}{2}$ oz. sugar	409
	Sundries ..	..	..	„ 6 oz.	461
				„ ..	151
40			3,161		3,004

THE TECHNIQUE OF CROSS-FERTILISATION IN POTATOES.

REDCLIFFE N. SALAMAN, M.A., M.D.

Large numbers of potato growers who are also potential raisers of new varieties of potatoes may find the following notes on the technique of cross-fertilisation of interest and value to them in their work. The operations of cross-fertilisation described might usefully receive the consideration of agriculturists.

Construction of the Flower.—The well-known flower of the potato plant is hermaphrodite, that is to say, both male and female elements are contained in one and the same flower.

The Female Organs.—In the centre of the flower is an ovary from which there projects a thin, green rod, the pistil, which terminates in a cushion-like knob known as the stigma. When the flower is ripe for fertilisation a slight sticky secretion appears on the stigma. The shape of the stigma varies in different potatoes, being notably cleft like a hot cross bun in some while quite small and round in others.

The Male Organs.—Ranged round the ovary are five yellow anthers on short, thick stamens; each anther is made up of two lobes. On the inner side of the anther each lobe will be seen to have a longitudinal depression (line of dehiscence) to its outer side, and as the anther ripens this depression ends in a small aperture on the inner side of the apex of each lobe. It is from this aperture that the pollen escapes. In nature the stigma is fertilised by the pollen of its own flower, which reaches it by being scattered from the anther through the small hole and falling on to the ripe stigma. It is found, however, that insects of all sorts freely visit potatoes when in bloom, and bees will undoubtedly hover over the flowers and carry pollen from one plant to another, so that in cross-fertilisation for scientific purposes it is necessary to take certain precautions which will be dealt with in detail later.

Difficulties in Cross-Fertilisation.—It is common knowledge that many potato plants form buds which never open, or at least fall before the flower opens. As a matter of fact varieties differ very much in respect to this property. There are some whose buds fall when they are no more than $\frac{1}{8}$ in. long; there are others whose buds will grow till they reach a length of $\frac{1}{2}$ in. or more and then fall; others, again, will bear buds which actually open and form flowers, but these flowers drop within

a few hours. Such plants are extremely bad subjects either as male or female parents. Those whose buds fall in the earliest stages are, of course, useless for cross-fertilisation; those whose buds do not fall until considerably later can be used as female parents, but the chance of obtaining a successful result is very small. As male parents such plants are useless, for the pollen does not ripen till the flower is well open, and it will be found that such flowers as do eventually open will have no pollen.

Another difficulty a potato raiser has is that a number of excellent varieties which produce beautiful blooms bear anthers which contain no pollen. A striking example is Up-to-Date. Of such plants it is true that by infinite perseverance an occasional flower—perhaps one in three thousand—can be fertilised, but even so, very few seeds will result. On the other hand, such plants are perfectly suitable as female parents and may be fertilised with the pollen obtained from any variety.

Importance of Observance of Technique.—In crossing any two varieties it is presumed that the raiser has a definite object in view and that he hopes to obtain offspring whose qualities will bear some definite relation to those of the parents he is employing. It thus becomes essential that he shall be perfectly sure that in making the cross the seed which arises is due to the union of the pollen he has introduced with the ovules or eggs of the mother plant. There must be no uncertainty as to whether these maternal ovules have been fertilised with pollen derived from their own anthers or with pollen possibly derived from a neighbouring and different variety and carried to the mother plant by a bee or other insect. It is therefore essential that he should observe a certain technique, and it is this technique which will now be described.

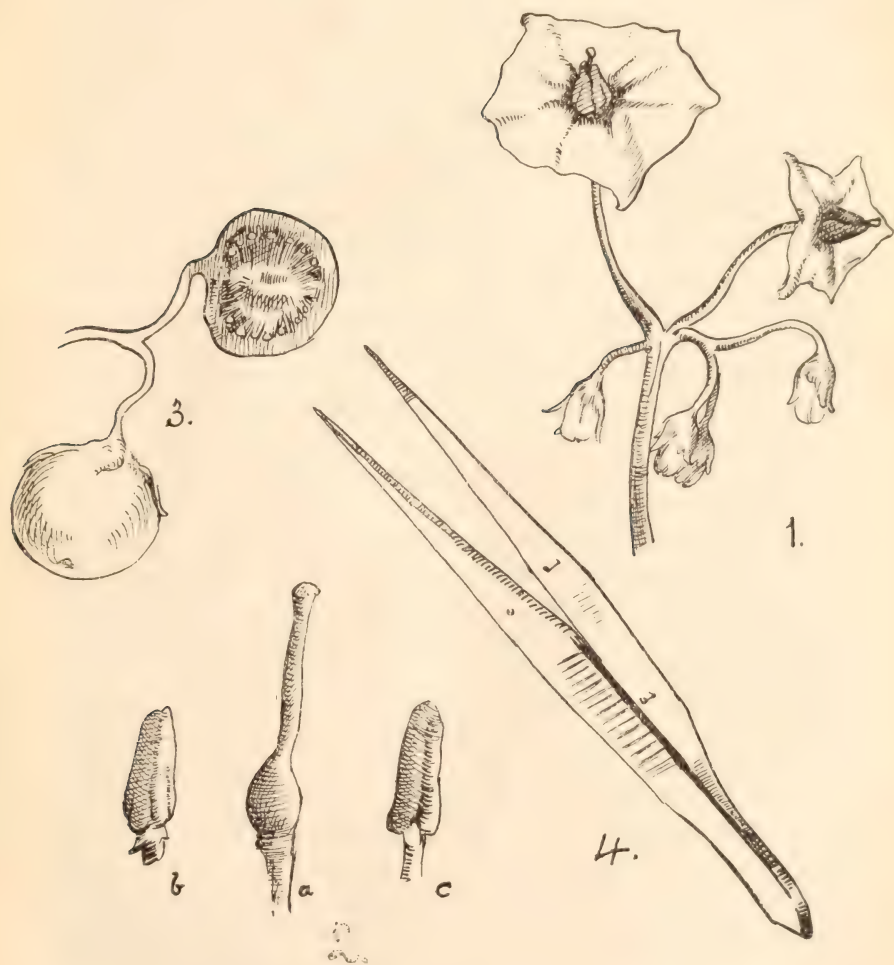
The raiser should provide himself with (a) a pair of fine-pointed surgical forceps about $3\frac{1}{2}$ in. in length, (b) a small narrow-necked (2-ounce) bottle filled with rectified spirit, (c) small shop labels about $1\frac{1}{2}$ in. by 1 in. with a fine string loop by which they can be attached to the stem of the flower (such labels are used by jewellers and other tradesmen for pricing small articles), (d) parchment paper bags about $9\frac{1}{2}$ in. by 6 in. (such bags are specially made for the purpose by Messrs. John Miller & Co., Ltd., 322-334, St. George's Road, Glasgow), and (e) copper wire $\frac{1}{32}$ in. in diameter, which should be cut into lengths of about 5 in.

Sterilisation.—Having chosen the mother plant, a cyme, or bunch of flowers, should be selected, and all flowers already

open should be nipped off with the forceps, leaving from three to five buds. These buds should, as far as possible, be all of the same size, about $\frac{1}{2}$ in. in length and in such a stage as to be ready to open. Buds which are considerably younger than this should be removed. The operator then dips his forceps into the bottle of alcohol for one or two seconds, shakes them to allow them to dry, then takes the bud between the finger and thumb of his left hand and very gently pushes open the petals. He will then find the anthers closely clustered round the stigma, and on inserting the fine point of his forceps very carefully between any two on the anthers and pushing the anthers outwards, he will find that they break off and are readily removed. All five anthers must be similarly treated and every bud of the group must be likewise emasculated. With very little practice the raiser will find that he can do this without in any way injuring the stigma. This done, he should affix to the stalk of the cyme a label stating the name of the maternal variety and the date of sterilisation. It is advisable that the forceps should be sterilised by re-dipping in the alcohol after each separate bud has been dealt with, lest any of the anthers may have been prematurely ripe and shed pollen on to the forceps, which might thus be accidentally conveyed to the stigma of the next flower. The bud having now been sterilised and the label affixed, the next step is to preserve it against contamination by insects. This is done by placing the group of buds within a parchment bag. The bag should be opened over the end of a round stick and on no account should it be blown into. When opened it is placed carefully over the buds, and the edges of the bag brought firmly together in a cluster round the stalk, and secured in that position by winding some of the copper wire already described around the neck of the bag. The label should be allowed to hang outside the bag.

Fertilisation.—If the weather is warm the buds within the bag will open fully from within 24 to 48 hours, and it is when they are open that fertilisation should take place. The most opportune time is when the stigma has the shiny and sticky secretion on it, but successful results may be obtained when this is absent. Probably the best time of the day is between 10.0 a.m. and mid-day, since as the day begins to cool the petals close and the flower is more difficult to manipulate and possibly not so ready to be fertilised.

Having selected the paternal parent the operator should remove the open flower and carry it to where the female plant



1. A Cyme with open Flowers and Buds.
2. (a) Pistil and Ovary; (b) Anthers from inner side—showing faint line of dehiscence in either Lobe; (c) Anther from the outer side, all enlarged.
3. Potato fruits; the upper one shown in section exhibits the seed.
4. A suitable pair of forceps.

is growing. The paper bag should then be removed, and the copper wire straightened out ready to be reapplied. Before proceeding with the operation of fertilisation the operator should sterilise his forceps and the thumb and forefinger of his left hand by means of the alcohol in the bottle—the fingers should be sterilised by allowing a few drops to run over them. When the alcohol has dried off, which it rapidly does in the open air, he should seize one of the anthers at its basal attachment with the forceps and hold it between the thumb and forefinger of the left hand in such a way that the line of dehiscence of the right-hand lobe is uppermost. With the forceps in the right hand the anther is gently split open along the line of dehiscence with the point of one blade of the forceps, and in so doing it will be found that a minute heap of white dust accumulates on the point of the forceps. This is the pollen.

The operator now very gently spreads the pollen on to the stigma of the female flower. This should be done so that the metal of the forceps scarcely touches the stigma at all, and the pollen should be distributed over the whole surface of the stigma. When the right-hand lobe of the anther has been thus emptied it is quite easy to turn the anther over in the fingers and expose the left-hand lobe and open that one in a similar manner. Where the pollen is abundant two flowers can be fertilised from each lobe, but this naturally varies with the amount of pollen and the skill of the operator. Having fertilised the flowers, the next step is to write the date of the operation and the name of the paternal plant on the label. The bag should then be replaced in exactly the same manner as it was put on. Forty-eight hours after fertilisation the operator should remove the bag and very gently nip off the stigma, leaving the pistil standing. This done, it is unnecessary to replace the bag. Within three or four days the flower will droop and the corolla fall off, and if fertilisation has been successful the individual flower stalk will thicken and the little cork joint which is to be found normally about 1 in. beneath each flower will become absorbed. At the same time the ovary swells into a berry which in ordinary varieties is round and like a tomato.

Growth of the Berry.—In most varieties the berry will grow till it is about 1 in. in diameter, but it is highly advisable when it has attained a size of about $\frac{1}{2}$ in. in diameter to fix a bag round it. The reason for this is that the berries must be left until the haulm dies down, and when this occurs it frequently happens that the berries either drop or are lost sight of at

digging time and many valuable fertilisations are lost, but if the bag is put back and fixed with its copper wire to the stem with its label carefully preserved inside, then the raiser is not robbed of his labours.

When the haulm has died down, the berry with its label attached and still contained within the bag should be removed. By this time it will be found that the berry is probably as much as 1 in. in diameter, is of a green colour shading off into purple, and is still quite hard. It should then be kept, still within the bag, in some open tray in a safe place protected from mice and other possible sources of injury. In February of the following year the berries should be opened and the seed extracted. This is quite a simple procedure. With a clean penknife the berry is split in two, the seeds squeezed and scraped out and spread on a piece of clean white blotting paper, 6 in. by 6 in., on which the name of both parents and the date of fertilisation should be written. Each seed is surrounded by a coat of mucilage which, on drying, will cause the seed to adhere to the blotting paper. When dry the blotting paper may be folded and kept in an envelope.

Sowing the Seed.—In the beginning of March the seed should be sown. It is first necessary to separate the seed from the blotting paper, which is readily done with a penknife. Sowing may be carried out in two ways: (a) the seed may be sown broadcast in pans and covered with silver sand and 6 weeks later pricked out, or, preferably (b) sown in a systematic manner in seed boxes. The soil surface of the seed box should be marked out in lines $2\frac{1}{2}$ in. apart, drawn parallel with both its sides and ends, the first line starting at $1\frac{1}{4}$ in. from the edge of the box. In this way a checker-board is produced, and if a single seed is placed at each intersection at a depth of 1 in., then the ensuing plant will be $2\frac{1}{2}$ in. from its nearest neighbour. By employing this method there is no need to prick out, and each seed is given a fair chance. The seed should be raised under very moderate heat, and when the seedlings are about $1\frac{1}{2}$ in. high they should be cooled off and hardened. They will not, however, be fit to plant out till the first week in June, when each seedling will be from 6 in. to 9 in. high.

Other Methods of Fertilisation.—It sometimes happens that the operator is not able to pay the necessary number of visits to his plot in order to effect the fertilisation in the manner described, and experience has shown that results can be obtained, though the method is not nearly so certain, by fertilising the bud immediately after its anthers have been removed. In

this case it is advisable to employ an abundance of pollen and then replace the bag and leave it for several days.

Some investigators will require to self-fertilise rather than to cross their plants. In this case the procedure is simplified. It is only necessary to remove all open flowers from the cyme and to protect the unopened buds (without further operation) by the bag, affixing the label as before. When the flowers are opened an anther should be removed and the pollen distributed on the stigma in the same manner as was done when cross-fertilising. The bag should then be replaced. It is important to remember that the sterility of an anther, so common in potatoes, is a dominant Mendelian character, and unless this is recognised difficulties will arise in later generations.*

Raisers should not be disappointed if they find the number of successful fertilisations to be small. Over a large number of years and using a great variety of plants, the number of successful fertilisations was never more than 5 per cent. of individual flowers treated, or, allowing three flowers to each pollination, 15 per cent. of the total number of female parents.

* For information on this subject the investigator is referred to the following papers :—

“ The Inheritance of Colour and Other Characters in the Potato,” *Journal of Genetics*, Vol. 1, No. 1, Nov., 1910.

“ Male Sterility in Potatoes,” *The Journal of the Linnean Society*, Botany, Vol. xxix., October, 1910.

SOCIAL SERVICE IN RURAL AREAS.*

SIR HENRY REW, K.C.B.

It is not necessary to dilate upon the urgent importance of the developement of social activities in the country districts. The dullness of village life has long been recognised as one of the main reasons for the migration of the sons of the soil to scenes of fuller activity, but efforts to alleviate it have been spasmodic and sporadic. The time has come when the human needs of the countryside have become insistent, and the future of agriculture is seen to involve a sociological, as well as an economic, problem.

In one respect efforts to stimulate social activities in rural life start with an advantage. In many, it may perhaps be said in all, country villages there is a tradition of social service which only needs to be re-invigorated and adapted to the new conditions. It is easy to sneer at the Lady Bountiful conception of human relationship, but criticism of it should be directed rather to the social system under which it existed, than to those who honestly tried to fulfil the responsibilities which fell upon them, and to do their duty conscientiously in that state of life to which they had been born. This spirit of social responsibility, which was the appandage of the inheritors of the patriarchal scheme of village life, must be widened and cultivated, so that all members of the community shall feel that their duty to their neighbour is a mutual obligation.

But if the countryside has a tradition of social service which may be counted for righteousness, it derives from its past other qualities which increase the difficulties confronting all attempts to revive the communal spirit. The psychology of the countryman is baffling, even to those who have spent their lives in the country. The recent improvement in the economic status of the farm worker, and still more the self-confidence which organisation awakens, have presented him in a new aspect to many who thought themselves well acquainted with him. The young men who return to the villages from the army have to a large extent abandoned the mask which has so long hidden the working of the rural mind. They have not only found expression, but they have thrown off timidity. Their fathers were inarticulate and timid by habit and instinct. Their real

* Read before the Conference of the National Council of Social Service in the Sheldonian Theatre, Oxford, on Thursday, 8th April, 1920.

feelings and thoughts were only discoverable by a few who combined insight with observation. One of the few—the author of “Folk of the Furrow”—who took peculiar trouble to observe and has also the gift of insight, says: “The people on the land have not been easy to approach because their qualities have been found difficult of interpretation by those who have not had the opportunity to penetrate below the surface.” It is true that from time to time there have arisen from the ranks of agricultural labourers, spokesmen who have voiced the aspirations of their class, but they were little heeded and their right to be regarded as representative was challenged. Now the farm workers are organised, and those who speak as their representatives can do so with the confidence which the authority of numbers gives. From them we know that the outlook of the men who live by the land is not restricted to wages, but that they are also claiming better opportunities for enjoying the amenities of life. They are before all a practical race, and have a wholesome distrust of those who promise the millennium. But they do insistently demand that life in the villages shall comprise something more than toil, and that its amenities shall extend beyond the limited resources of the ale-house.

This demand must be met, and met without delay, if English rural life is to continue, and a countryside population, which is so vital to the welfare of the nation, is to be maintained. The demand is universal. The organisers of the Village Clubs Association have only been actively at work for a very few months, but in all parts of the country they have visited—from Lancashire to Sussex, from Norfolk to Devonshire, from Hertfordshire to North Wales, from every county and district—the demand is the same. The Women’s Institutes, of which there are some 1,500 throughout England and Wales, testify to the same urgent need. All recent inquirers into the rural problem are insistent on the subject. The case is well put in the Report of the Adult Education Committee, of which the Master of Balliol was Chairman:

“The rural problem, from whatever point of view it is regarded—economic, social or political—is essentially a problem of re-creating the rural community, of developing new social traditions and a new culture. The great need is for a living nucleus of communal activity in the village, which will be a centre from which radiate the influences of different forms of corporate effort, and to which the people are attracted to find the satisfaction of their social and intellectual needs. We conceive this nucleus to be a village institute, under full public control. Its size would vary with the number of people it was designed to serve. . . .

"The institute should be the headquarters of organised local activities of all kinds. Trade union branches, friendly societies, pig clubs and bee clubs, and agricultural and horticultural societies of one sort and another, adult schools and classes arranged by voluntary organisations, women's institutes, schools for mothers, chess clubs, and so forth, should be encouraged to use the institutes; and one or more rooms, as may be necessary, should be provided for the purposes of their meetings. The institute should contain a hall large enough for dances, cinema shows, concerts, plays, public lectures, and exhibitions. At the institute there should be a public library and local museum. If arrangements can be made for games and sports, so much the better. The institute, in a word, should be a centre of educational, social and recreational activity."

This passage expresses fully and forcibly the primary aim of the Village Clubs Association. The Women's Institutes, although they were formed, as their name implies, for only one sex, and did most admirable work during the War when so many of the other sex were absent from the villages, are now co-operating cordially in the effort to extend the principles which they advocate, so as to embrace all the members of the community.

The difficulties of providing buildings where they do not exist are at the present time very great. The suggestion of the Committee just quoted, that village halls should be provided out of public funds, is one which has obvious attractions, and unquestionably a very strong case can be made out for the adoption of this course. A building in each village, held in trust for the benefit of the whole community, and free from any restrictions as to its use, other than those necessary for order and decency, would be a public advantage, and it would provide facilities for carrying on public work, such as, for example, continuation schools, which may often be hampered by the lack of such accommodation. A village hall is as necessary as a town hall, although the purposes which it should serve are more varied and comprehensive. Its design would be different, and its accommodation proportioned to the needs of the population, but it should be essentially the centre and focus of the active life and social interests of the community.

Local authorities have at present certain powers of rendering financial assistance for the erection of village halls.

District Councils can, as part of a housing scheme and subject to the approval of the Ministry of Health, provide a Public Hall, and in such a case the financial assistance given by the Exchequer to Housing Schemes would be available.

Parish Councils may levy a Rate not exceeding 3*d.* in the £ (or, with the consent of a Parish Meeting, up to 6*d.* in the £).

This is the maximum allowed, and must cover the whole expenditure of a complete financial year. It may include the provision and maintenance of buildings required for Public Offices, meetings, etc. But subject to this limitation they may further the erection of village halls in the following ways :—

- (a) If the hall were erected by voluntary subscriptions they can accept it as a gift for the benefit of the inhabitants of the Parish, and so become responsible for its future maintenance.
- (b) They can contribute towards the cost of erection, as a war memorial, with the sanction of the Ministry of Health.
- (c) They can contribute towards the cost of erection, as a building which would be partly used for public offices or for meetings, and could raise a loan for this purpose with the sanction of the County Council.
- (d) They can erect the building as a war memorial and for public offices or for meetings (with sanction as above mentioned) and receive voluntary subscriptions as contributions towards expenses.
- (e) If the building were to be used partly as a public library they can take action by adopting the Public Libraries Act, 1892, which would enable them to raise a *1d.* rate for that express purpose. The adoption must be by the Parish Meeting.
- (f) A Parish Council may let any building vested in them, but in the case of a building erected at the expense of the rates, may not do so for more than one year, without the consent of the Ministry of Health.

Under the Ministry of Agriculture and Fisheries Act, the new county agricultural committees are directed "to make such inquiries as appear to them to be desirable with a view to formulating schemes for the development of rural industries and social life in rural places, and for the co-ordination of action by local authorities and other bodies by which such development may be effected, and shall report the result of such inquiries to the Board and to any local authority or body concerned, and the expenses incurred by the Committee under this sub-section to such amount as may be sanctioned by the Board with the approval of the Treasury shall be defrayed by the Board."

This express statutory recognition of the importance of the development of social life in rural places is satisfactory and

significant. The county agricultural committees must be set up within six months after the passing of the Act, but it is premature to speculate what the results of their action may be.

There are 62 County Councils, 650 Rural District Councils, and over 7,000 Parish Councils in England and Wales, and only a very sanguine person will expect that all of them—or even any considerable proportion—will immediately use even the limited powers they possess for the development of social life in the villages. While, therefore, doing all that may be possible to secure substantial assistance, whether pecuniary or otherwise, from public authorities, we cannot afford to wait, and it is better to assume that, in the future as in the past, voluntary effort is imperative if timely and effective progress is to be made. Much has already been accomplished by the public spirit and enterprise which still happily characterise English men and women. A large number of village halls are already erected, sometimes by individuals and sometimes by the collective energy of the community. We are gradually collecting data which will in due time enable us to compile a record of the village halls and institutes throughout the country, but our information is still far from complete. The Village Clubs Association and the Federation of Women's Institutes recently had occasion to make inquiries in a certain number of villages, and received reports from 356 villages scattered over 46 counties which indicated that in a considerable number of those villages club-houses or institutes, available for the use of all the inhabitants, were in existence.

In spite of the great difficulty of building, much is being done. In many villages the collection of funds for the erection of a hall or institute is actively proceeding, and in this work the Women's Institutes are rendering most valuable service. Feminine ingenuity and assiduity in financial matters are being devoted with exemplary zeal to levying, both by direct and indirect methods, contributions from all classes of the community towards the provision of a hall or institute for the use of all the inhabitants. It is a very hard task in many of the smaller and more remote communities, where persons of means are few or apathetic. There is no doubt, however, that the effort to erect their own hall is in itself a stimulus to the communal spirit. Instances have come to notice where a building is being gradually erected by the personal labour of the villagers, and the result in such cases will be a pride of possession which can never be aroused in the same degree by the acceptance of a gift. Provision from extraneous sources is therefore not an

unmixed blessing, and, personally, I should prefer that funds should be available to supplement local effort rather than to supplant it. Is it too much to hope that some person or persons of wealth will see an opportunity of promoting in the most direct way the happiness and contentment of our villages, and thereby winning immortal fame, by providing a fund from which grants could be made to enable those who are doing their utmost to help themselves, to complete their work before they abandon it in despair?

The recent establishment of a Rural Department of the Council of Social Service testifies to the general recognition of the importance and urgency of the rural problem. The initial need for some co-ordinating body is great. I have spoken of efforts already being made, and it is quite true that more is being done throughout the country than is generally known. Those who are doing it are not given to advertisement, and in these days much of the best work is the least advertised. Even those who are well-informed with regard to social work in the towns are often ill-informed as to activities in rural districts. In a book just published, which gives a very useful introduction to the whole subject of social service, only two or three pages are devoted to work in the villages, and no indication is given of the attempts which are being made to grapple with it. We are hoping to modify that kind of attitude. The Rural Department is intended to ensure that the rural side of the problem secures at least its proportionate share of attention. We are well aware that this is predominantly an industrial country, and that the inhabitants of rural districts in England and Wales, according to the last census, represent little more than one-fifth of the total population. We recognise that the complexity of town life presents special difficulties to the social worker. But we claim that the maintenance in comfort and contentment of the rural population has an importance to the State which cannot be measured by arithmetic, and that the comparative simplicity of country life is in itself an impediment to social organisation.

I make no attempt to formulate a definite programme. We stand in the first instance for the principle of co-ordination of all efforts for the betterment of rural conditions. We seek the co-operation of all persons of good-will who are aiming in diverse ways to assist and develop social activities in the villages. Co-ordination and co-operation do not imply centralisation. The only centralisation we want is a centralisation of ideas; and the only combination we want is a combination for mutual

help and inspiration of those having similar aims. The bed-rock basis of the two organisations * for which I speak is self-government for every unit. It is possible that social work in the towns may in some degree be standardised. But it is certain that you cannot standardise the country districts. Just as in farming every field requires separate study, so every village presents its own particular problem. But those who are grappling with a thousand local problems can bring to a common stock the experience which will help in the solution of all. It is our hope that the Rural Department of the Council of Social Service will form not only a clearing house for ideas, but also a real stimulus and present help to all those who are working for a fuller and brighter life in the villages of England's green and pleasant land.

* The Village Clubs Association and the National Federation of Women's Institutes, Sir H. Rew being Chairman of the Joint Committee of the two bodies.

VILLAGE INSTITUTES AS AN AID TO RURAL EDUCATION.

SOME instructive passages on the question of rural education in its relation to the development of village life are contained in a Report on the problem of adult education* issued by the Ministry of Reconstruction some months ago.

The Committee considers that the improvement of the social and intellectual life of the village is essential for the maintenance of a vigorous rural population. In this respect the events of the last five years should have opened the way for reconstructive action. New circumstances have been created which offer better prospects of success in the immediate future. The soldier from the countryside has returned to his civilian duties influenced by the more varied social and educational opportunities—plays, concerts, lectures, study circles and classes—of military life, while those who remained on the land during the War have enjoyed a wider experience than was common in the past. Further, the growth of the Trade Union Movement and the establishment of the District Wages Committees have given the men new interests. Yet unless country life provides more avenues than are open at present for the employment of leisure time, it is certain that the drift to the towns, which was so noticeable in the past, will continue. In order to prevent this exodus to the towns the great need of the village is, in the Committee's opinion, the improvement of the social life of the countryside. The rural problem is essentially a problem of re-creating the rural community, of developing new social traditions and a new culture. What is needed is to establish in the village a living nucleus of communal activity which will serve as a centre for the satisfaction of the social and intellectual needs of the people. Such a nucleus the Committee conceives to be a Village Institute, under full public control.†

The Committee's idea of a fully-developed Village Institute is thus outlined in the Report :—

* Cmd. 321. 1919. Ministry of Reconstruction, Final Report of the Adult Education Committee. London : H.M. Stationery Office, 1s. 9d. net, excluding postage.

† The passage of the Report in which the Committee's views on this matter are expressed is quoted on p. 146. The article by Sir Henry Rew on "The Social Service in Rural Areas," which appears on p. 145 of this issue, should be read by all interested in the Village Institute as a means of improving rural conditions of life.

"The Institute should be the headquarters of organised local activities of all kinds. Trade union branches, friendly societies, pig clubs and bee clubs, and agricultural and horticultural societies of one sort and another, adult schools, and classes arranged by voluntary organisations, Women's Institutes, schools for mothers, chess clubs, and so forth, should be encouraged to use the Institutes; and one or more rooms, as may be necessary, should be provided for the purposes of their meetings. The Institute should contain a hall large enough for dances, cinema shows, concerts, plays, public lectures, and exhibitions. At the Institute there should be a public library and local museum. If arrangements can be made for games and sports, so much the better. The Institute, in a word, should be a centre of educational, social and recreational activity."

It has been pointed out in a Memorial to the Committee that the schools possess certain advantages for library accommodation, as the master is more or less in direct contact with the villagers, and the school children can readily carry the books home to their parents and relatives and also act as a medium of return. The school, however, may not always be the best depository for the periodical consignments of books to be brought from the general central library, and where Village Institutes and similar organisations exist the books may be better placed therein.

Accommodation.—Under present conditions these activities are carried on to a greater or less extent, but more often than not they are hampered partly by the lack of accommodation free from definitely sectarian or cramping philanthropic control, and partly by the unsuitability of such accommodation as exists. In the opinion of the Committee nothing short of a great national programme designed to provide in every parish an Institute suited to its needs will meet the requirements of the rural community in the near future.

Cost.—With regard to cost, it is suggested that the Institutes should be established out of public funds. The Committee states that the cost could not be borne by Parish Councils or even County Councils; it mentions also that the Institutes would be used more and more for public and quasi-public purposes.

A National Concern.—In the main, the Committee considers that the establishment of Village Institutes should be a national charge. Direct encouragement should be given to the estab-

lishment of a new communal organisation and to the development of corporate activities and social institutions in harmony with modern social ideas. The State cannot create a new social spirit ; it can but provide opportunities for its growth and expression. One of the chief of these opportunities is the Village Institute, and the Committee states that it can think of no more profound and far-reaching piece of rural reconstruction than the provision of buildings expressly designed as a focus of the social activities of village communities. Whether such Institutes become active centres of social and educational work will depend largely upon the degree to which voluntary organisations of various kinds co-operate in utilising the opportunities which the Institutes present. It is clear that a Village Institute can never become the mainspring of organised life unless the organised activities of the village centre in the Institute. The success of Village Institutes in the future rests upon an appeal to groups of people with common interests, rather than to individuals. It is because such groups have in recent years begun to flourish that the Committee looks forward hopefully to a vigorous life within the Village Institutes. It may well be that the Women's Institutes, which have taken root in rural districts during the past four years, should in many places provide the social stimulus and basis of social organisation necessary for these continuous and varied activities without which Village Institutes must become moribund.

State Aid.—The proposal of the Committee is that the State should make a grant-in-aid, as and when the demand arises, to Parish or Rural District Councils, through the County Councils, in respect of capital expenditure, amounting to 90 per cent. of the total cost. The remaining 10 per cent. should be raised locally. The total cost to the State of such a scheme for Great Britain might amount to £5,000,000, or even more. Once the Institutes were established, it should be possible for a Parish Council or Rural Council District, as the case may be, to maintain the activities carried on in them. In the case of societies using the rooms for meetings of classes, a small fee would be charged. Where concerts, plays, public lectures, cinemas, and exhibitions were arranged, they would be a source of income, whether they were initiated under the auspices of some voluntary organisation or movement or by the Parish or Rural District Council.

The Development of Educational Facilities.—The Committee makes a number of recommendations on the development of educational facilities in rural areas. It considers that educa-

tional work in the village should be put upon a permanent basis, so that in normal circumstances the village may never be without some form of serious intellectual activity adapted to the needs of the students as regards both subject-matter and methods of treatment. In arranging educational classes, the Committee thinks that it may be found necessary to devise a winter session, shorter than that which has been adopted in the towns, and the normal winter class might well be of twenty weeks' duration.

Classes.—The Committee is inclined to think that there should be some half-way house between the one-year class and the tutorial class meeting for three winters of twenty-four meetings each. A modified university tutorial class meeting for twenty weeks during two consecutive winters might be found to meet a real need in rural districts.

While it is important that study circles and classes should, as far as possible, be arranged in every village, such a network of activity would by no means fully meet the needs of rural areas. It is desirable that the market towns and larger villages should become the centres of educational activity and that classes, week-end conferences, exhibitions, and similar projects, should be arranged in them with the co-operation of the surrounding villages. It is in these rather larger centres of population that the Committee expects tutorial classes, or the modified form of tutorial classess suggested above, to be held. These centres would also meet the special needs of those for whom it is impracticable to make adequate provision in their own villages. The market towns and larger villages would naturally become the focus of the educational work carried on in the surrounding villages, and would provide the opportunity for that co-operation between various groups which the Committee regard as essential.

Importance of Association and Voluntary Organisation.—The Committee feels convinced that a rural educational movement would be short-lived, unless classes and groups of students were associated together in some way and imbued with a corporate spirit. It is desirable that voluntary organisations in rural areas should co-operate with a view to federating adult educational work within their districts.

It is proposed that "summer" schools and "summer" meetings, which have usually been carried on during the summer months, but which may be extended to the winter months, might form an integral part of the general educational scheme. Federated groups of students would make arrangements for

week-end lecture schools, but tutorial schools and "summer" schools might occasionally make their headquarters in a rural district, to the mutual advantage of both town and rural students.

Appointment of Educational Officers.—With the development of the work in rural areas it would become necessary to appoint resident organisers for the purpose of opening up new centres and carrying on the administrative work without which the various villages cannot be linked together. These organisers should be fully conversant with country life and rural needs, and, in view of the difficulty of obtaining teachers and lecturers, it would be advisable that they should be able to take part themselves, as far as circumstances allowed, in teaching work. The Committee does not, however, look upon this as a satisfactory solution. It considers that, just as in the case of towns, the development of a system of resident tutors and the decentralisation of university extra-mural education is desirable, and it therefore regards the gradual establishment of resident tutors and lecturers in rural areas as a necessary part of the general scheme of rural education.

LIMING IN HEREFORDSHIRE :

ENCOURAGEMENT OF A LOCAL INDUSTRY.

JOHN PORTER, B.Sc., N.D.A., N.D.D.,

Organiser of Agricultural Education for Herefordshire.

FOR some years there have been indications that the soil of Herefordshire was becoming impoverished by the exhaustion of its lime constituents. The diminution of crop-yielding capacity became increasingly noticeable during the War, and such unsatisfactory returns were obtained that many farmers experienced difficulty in cultivating their land at a profit. Contributing factors to this exhaustion were the using up of lime by the natural development of acidity in the soil, the continued use of sulphate of ammonia and superphosphate, and the removal of lime from the soil by farm live stock and crops.

The Herefordshire Agricultural Education Sub-Committee therefore decided to investigate what steps might be taken to improve the situation. On behalf of the Committee the writer visited certain unsatisfactory cropping-land in the county, and found it to be covered with sheep's sorrel, spurrey and other plants which flourish on acid soils. Chemical tests were made, which showed that the soil was very deficient in lime.

Results of Liming Experiments.—The following experiment gives interesting data as to the value of lime on this sour soil, conducted on mangolds and swedes in order to test the effect of a "complete" mixture of artificial manures, both with and without lime. A field was selected for the purpose, and three plots were marked out and given a medium dressing of farmyard manure. One of the plots received in addition a dressing of artificials and lime, and one plot a dressing of artificials only. The lime was applied in the autumn at the rate of 30 cwt. of carefully slaked lump lime per acre, and the artificial manures were applied in the spring.

The two plots receiving artificial manures showed considerable improvement over the unlimed plot, but the improvement in the case of the plot receiving lime in addition to artificials gave much better results.

The yields per acre of roots at the close of the season were as follows :—

	<i>Mangolds.</i>			<i>Swedes.</i>		
	<i>Tons, cwt.</i>			<i>Tons, cwt.</i>		
No artificials	12	19	..	14	4	
"Complete" artificials ..	19	0	..	19	6	
"Complete" artificials and lime	23	17	..	23	0	

These results are of great value in showing that land of this kind can benefit considerably by a dressing of lime in addition to artificial manure. There is no doubt that much land in the country is not yielding up to its fullest capacity owing to deficiency in lime, and needs treatment on similar lines.

Transport and Labour Difficulties.—Before the need for increased supplies of lime can be met two difficulties in regard to transport and labour have to be overcome, viz.—

(a) Ground lime has to be brought from 60 to 100 miles, *i.e.*, from Derbyshire or Somersetshire, by rail, with heavy railway expenses; alternatively

(b) The clot or lump lime, which is available in adjacent counties (*e.g.*, Radnorshire and Monmouthshire) can be transported to Herefordshire by rail at a smaller cost per ton, but as it has usually to be distributed by shovel it needs to be supplied at a much greater rate per acre than ground lime; hence there is no saving of expense.

In the face of the expense involved, farmers are naturally reluctant to purchase lime for their land.

Local Limestone.—Having regard to this fact, the Agricultural Education Sub-Committee considered the possibility of utilising the local supplies of limestone for agricultural purposes. These supplies consist of Silurian Limestone in the eastern and northern parts of the county, and Carboniferous Limestone in the south, while Cornstones occur in small quantities distributed throughout the Old Red Sandstone formation of the central and western parts of the county. With a little arrangement it should be possible largely to overcome the difficulties experienced in securing lime from a distance, by developing local supplies, if only limestone of a satisfactory quality could be ensured and the amount available were sufficient to encourage enterprising firms to take up the matter.

Estimated Amount required for Agricultural Purposes.—It would seem that there is justification for anticipating a sufficient demand. There are approximately 150,000 acres of arable land in the county at present, which ought to receive a minimum dressing of, say, 2 tons of lump lime per acre (or 10 cwt. of ground lime at least once in eight years). On this basis, 37,500 tons of burnt lump lime (or, say, 10,000 tons of ground lime) would be required each year for liming arable land in the county.

The 295,000 acres of permanent pasture land in the county have not been taken into account in the above calculation. The lime removed by the continual grazing of the young cattle, sheep and horses, will, however, need to be returned to the soil in some form or other if the best results are to be obtained in the future.

In addition to the supplies which are needed for agricultural purposes, lime and limestone would be required for other industries, such as building and road construction. There is every reason, therefore, to believe that the demand would be large.

Quality of Local Limestones.—The next step of the Committee was to take samples of the limestone in the county for analysis, but a report was previously obtained from each County Councillor as to the location of any lime-kilns in the district which he represented. The County Councillors were also asked to state (1) the owner and occupier of the lime-kiln, (2) the length of time which had elapsed since the kiln was used, (3) whether there was an abundant supply of limestone available, etc.

From this information, a selection was made of the limestone quarries from which it was proposed to take samples. An effort was made in each case to get in touch with the local lime-burner, so as to ensure that samples should be obtained from the stratum of limestone most favoured for burning purposes. In the course of receiving these samples the immensely important practical point was revealed that the *grey crystalline limestones* of the Silurian formation which were most favoured for burning for lime are found nearer the surface of the quarry than the "dark grey" and "blue" limestones, which are more suitable for road-making purposes. The eighteen samples taken were then forwarded to Mr. John Hughes, F.I.C., County Analyst for Herefordshire, who reported as follows as to their quality:—

No. of Sample.	Name of Quarry.	Carbonate		
		Silica. Per cent.	Magnesia. Per cent.	of Lime. Per cent.
10.	Great Doward Whitestone Quarry	0.10	?	99.80
1.	Ledbury Hill (Greystone) ..	2.30	?	96.30
4.	Cradley (Shapland's) ..	3.40	?	94.30
2.	Ledbury Hill (Dark Grey-stone)	2.70	?	94.20
5.	Cradley (Lockyear's) ..	6.70	?	91.90
15.	St. Margarets (Whitehouse, "Woodfield")	5.25	?	91.69
9.	Hope Mansell (Silverstone Farm)	6.80	?	90.30

No. of Sample.	Name of Quarry.	Silica.		Magnesia.		Carbonate of Lime.
		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
18.	Ross (Howle Hill)	9.00	?			89.10
16.	St. Margarets (Whitehouse, " Lime Kiln ")	9.20	?			88.00
6.	Mocktree (Grey Limestone) ...	8.80	?			85.50
7.	Mocktree (Blue Limestone) ..	12.70	?			85.10
17.	Grendon Bishop (Newbury)	11.10	1.08			84.44
13.	Mordiford (Little Hope) ..	15.70	?			81.40
14.	Fownhope (Rugend) ..	16.90	?			80.20
8.	Aymestrey (Pyon Wood) ..	17.65	?			79.20
3.	Ledbury (Bluestone) ..	19.30	?			75.90
12.	Drybrook	1.50	19.69			55.80
11.	Great Doward Hill (Black- stone)	2.40	20.23			54.30

The agricultural value of limestone depends upon its purity and richness in lime. The above results, therefore, indicate the respective value of the several samples. No. 10 is exceptionally rich, and Nos. 1, 4, 2, 5, 15, and 9 may be regarded as good agricultural limestones. Nos. 7, 17, 13, 14, 8 and 3 contain too much insoluble silicious matter to be useful for agricultural purposes, either in the form of ground limestone or caustic burnt lime. Nos. 12 and 11 are magnesian limestones frequently regarded as of inferior value, but, nevertheless, distinctly valuable for treating sour soils.

If ground into a fine powder the lime in samples 10 and 3—respectively the richest and poorest in lime—is completely dissolved in a very weak solution of citric acid (*i.e.*, 1 part citric acid in 1,000 parts water); if, therefore, the limestone could be reduced to a fine powder it would be admirably adapted to the Red Sandstone soils of Herefordshire.

Distribution of good Agricultural Limestone.—The above Report of the County Analyst is exceedingly valuable, and shows how fortunate the county is so far as the situation of good agricultural limestone is concerned.

The soil east from Hereford is a stiff clay soil, which requires liberal dressings of burnt or caustic lime in order to bring the soil down into a nice friable condition. In this area excellent limestone quarries exist at Cradley and Ledbury, both well supplied with lime-kilns. Limestone burning was being carried on at Cradley at the time of sampling the stone, and Ledbury has since commenced the work.

South of Hereford the soil is a sandy loam, on which it is better to use lime in the mild or unburnt form. The large supply of a pure limestone on the top of Doward Hill is very valuable; all that is required for local use on the land is to

grind it down to a fine powder, without previously burning. For distribution, an enterprising firm could place storage bins at Symonds Yat Station, as well as at a convenient point at the bottom of the hill between Symonds Yat and Whitchurch, where it could be conveyed by road to different farms. These bins could easily be filled by trucks carried on an overhead railway from the point of quarrying and grinding the stone. It would also be a great advantage to have one or more steam lorries, so as to be able to deliver the ground limestone for the farmer.

The Golden Valley has a fairly good limestone and kilns close to Vowchurch, but the limestone quarries sampled in the north of the county have not proved so satisfactory. Fortunately this district has an excellent supply of lime in the New Radnor district.

The Agricultural Sub-Committee is giving all the publicity possible to the fact that suitable agricultural limestone exists in the county, and already its efforts are bearing fruit.

Co-operative Burning.—In the Aymestrey District the writer learnt that a small limestone quarry used to be worked for agricultural purposes by about half a dozen neighbouring farmers. Each farmer assisted with the quarrying of the limestone and the carting of the coal, and after burning received his share of the lime.

Dual Purpose Quarries.—The quarry at Ledbury Hill is an interesting case of a dual purpose quarry. It has been taken on lease by the Ledbury Rural District Council with the primary object of supplying stone for the roads. To reach the stratum containing the road stone, however, it is necessary to cut through an upper stratum which, as already explained (p. 159), contains lime excellently suited for agricultural purposes. The quarry is thus worked with the double purpose of obtaining both kinds of limestone. This is certainly one of the most economical ways of working a quarry, and the system should be extended in rural districts where suitable limestone quarries are being worked by the County or District Councils.

FARM ACCOUNTS, PROFITS, AND COSTS.*

H. G. HOWELL, F.C.A.,

Director of Agricultural Costs, Agricultural Costings Committee.

FEW would deny that there is an urgent need for farm accounts to be kept on a much wider scale than hitherto. The industry as a whole has probably lost considerably both in money and efficiency by the prevailing neglect of farm book-keeping. There is on this subject a surprising unanimity in the reports of several Government Committees of Inquiry which have been instituted recently. Without exception they record the lack of information and urge the necessity for more and better account keeping.

It is not difficult to understand why farm book-keeping has been neglected in the past. The term book-keeping itself reeks of the town and the office and indoor work. The farming community has been proud of its isolation and distinctiveness from the town, and suspicious of all that is connoted by factories, ledgers and the like. It has maintained its high level of technical efficiency in the past without book-keeping assistance. The average farmer is an open-air man with a temperamental objection to account books, and with little time and less inclination to think about them.

This state of affairs, however, is an old and closed chapter. All the circumstances are altered. Farming has not escaped the rapid flux and change which has been observable for a number of years, and has been accelerated during the last five. The increasing cost of all farming expenses; the pressure of Income Tax Assessments; increasing competition; the development of transport, tending to bring town and country together—all of these combine to force the question of farm book-keeping to the front.

Kind of Accounts.—When speaking of farm accounts, I am not referring to the farmer's Bank Pass Book. If he is relying on that to know his financial position from time to time he is unwise. The position disclosed by the Pass Book is too indefinite. Private transactions may be mixed up with those of the farm, obscuring the results; amounts owing to

*Resumé of an address delivered to the Agricultural Club, 80, Pall Mall, London, S.W. 1, at their meeting on the 11th February, 1920.

and by the farm are not taken into account, nor differences in the amount of the valuation at the beginning and end of the year.

Most of the above objections apply equally if the kind of account relied on is one of cash receipts and payments only, without a valuation and without regard to the amounts owing.

A simple method of book-keeping for small or medium-sized farms is to use a Cash Book with several analysis columns on either side, and a farm diary. This method will enable the farmer to keep the private transactions separate, to account for all the monies he receives, and to verify the correctness of his Cash Book with the Bank Pass Book. At the end of the year the totals of the various analysis columns of the cash book are the foundation of his annual statement of account, in which will be entered the amounts owing to and by the farm at the end of the year, and the amount of the Inventory and Valuation. This plan is the simplest that will give efficient results; in some cases, including the larger farms, more books will be necessary.

Advantages.—In all cases accounts are a valuable source of information, and in most cases they save money. One of the main objects in keeping accounts is that the farmer may know at regular intervals how he stands, and to what extent his farm is paying. Knowledge of the facts is the first step towards economy, and the proper control of expenses and of the whole financial side of the farm business.

The expenses of the farm can be divided into as many headings as is desired and a watch kept on each expense with a view to economy. The various sources of income can be similarly classified, and useful comparisons made from year to year.

Proper accounts will prevent the possibility of an account being paid twice; will save trouble with disputed accounts; and enable track to be kept of troublesome things such as sacks, over which a lot of money is lost every year. Further, if the farmer wishes to obtain a loan from his banker, it is more easily arranged if he can produce a proper statement of account—and other advantages ensue.

The strongest inducement to account keeping may be mentioned last, *i.e.*, liability for Income Tax Assessment. A farmer may now choose to be taxed on his profits instead of on the double rental, but in this event, he must produce accounts to the authorities. Though the great majority

of farmers at present pay Income Tax on the rental basis, an increasing number are finding it necessary to ascertain their profits or losses from year to year, in order to have the information available for Income Tax purposes if necessary.

FARM PROFITS.

General.—Although by no means the only object, one of the objects of keeping accounts is to ascertain the result of the year's operations in the way of profit or loss. It is often thought that once the accounts have been made up and a resulting figure shown of profit or loss, that figure is a matter of fact about which there can be no dispute or difference of opinion. This is not so. Profit in most, if not all, cases is much more a matter of estimate and opinion and valuation than a matter of fact. Before accepting as correct the amount of profit shown by any account, it is necessary to consider the various steps by which that profit has been arrived at, and the questions of valuation, apportionment and principle that have been dealt with in arriving at the profit.

There are many reasons which account for the difficulty in settling the real figure of profit in a given case, and some of these will be briefly considered.

1. Arbitrary Period.—The period for which accounts are usually made up—12 months—is quite an arbitrary one. We are compelled for various practical reasons to show the results of farm operations at regular yearly intervals. It becomes important for many reasons, amongst which are profit-sharing schemes and assessments for Income Tax, that the profit should be allocated as correctly as possible to its proper year, and many of the difficulties arise through the necessity of doing this.

Again, some of the profits or expenses cover more than one year. A case in point is the raising of cattle which are sold after, say, three years. If a profit eventually results on the sale, in what way should that profit be apportioned over the three years during which the stock was being raised? A valuation of the stock at market prices each year may or may not bring about this result, while if the stock is carried forward at cost price until sold, the whole of the profit will be shown in the third year.

An analogous case, on a larger scale, is that of a building contractor who contracts for a building, the erection of which will take three years. The practice in apportioning the profit

in these cases varies. Sometimes the work is carried forward at cost and no profit is shown in the accounts until the building is completed. Or, again, some proportion of the profit may be taken credit for in each of the three years of construction, according to the progress of the work. But any such anticipation of the final profit is generally made on a most conservative basis. The comparison with the farm cattle differs in this respect, viz., that the contractor knows the final price he will receive on completion of the work, while the farmer does not know how the markets will stand when his stock is ready for sale. There is consequently greater need for him to be cautious in taking credit for any intermediate profits.

Again, expenditure may be incurred, the beneficial results of which will last for more than one year, such as laying hedges or drainage work. This outlay in ordinary cases should be written off in instalments over the period receiving the benefit. The benefit of cleaning the land and applying manures lasts for more than one year, but if the rotation is steady and the same cultivation and manuring is followed, these matters will average out.

2. **Valuation.**—(a) *Introductory.*—As the farm is a going concern, there are at the end of any year a number of unfinished transactions. Many of the difficulties in arriving at a proper figure of profit would disappear if all the transactions had been completed and realised or paid in cash (say at the close of a farm tenancy). In practice this is impossible. All the operations of raising and selling the produce are going on continuously. The final results of these operations cannot be ascertained until they are realised in cash, and in the meantime they have to be valued, for the purpose of making up each annual account. This element of valuation is one of the chief factors involved, and there is wide scope, not only for differences of personal opinion, but also for different methods and principle to be applied in making the valuation.

(b) *Two Classes of Stock.*—The various items of live and dead stock that are the subject of valuation at the end of each year are not all of the same character, and are not meant to serve the same purpose in the farm economy. This may affect the basis on which the two classes of stock are brought into the Accounts. In general terms, two distinct classes of stock are generally included in the valuation, which may be termed "Fixed" and "Circulating."

(c) *Fixed.*—Machinery and implements, work horses, breeding stock, etc. These are not intended to be sold but to remain

on the farm as the means of production for that farm. They are to that extent fixed or permanent or capital assets, and in their present or equivalent form they must always be employed on the farm while its present system of farming is continued. They will be referred to as "fixed assets." They are the property *with* which the farm is carried on, and the essential point to remember is that they are retained for production purposes, and are not intended to be sold.

(d) *Circulating*.—The other class is represented by the crops and live stock held for sale, miscellaneous stores of fertilisers, feeding stuffs, etc., and tillages. These are primarily meant to be *sold* and are not intended to remain on the farm. Some of the crops may be sold, not as crops, but in the form of the live stock to which they have been fed.

The first class has already been termed the fixed asset, and these may be correspondingly termed the "floating" or "circulating" assets, in that they are always circulating, *i.e.*, when they are sold they are turned into cash—this cash in turn is used to purchase other live stock or to produce other crops and stock—these in turn will be again converted into cash, with which crops and stock will be again produced—and so the process continues during the whole tenancy.

(e) *Alternative Bases of Valuation*.—There are alternative bases on which the valuation may be taken, which need consideration.

All, or any, of the items in the valuation may be taken at cost price, or market price, or at something under market price, or at a fixed price, or on some other basis.

I will deal in detail with two of these—the Cost Basis, and the Market Basis.

(f) *Cost Basis*.—By this method all the live and dead stock is carried forward in the accounts at its cost price until it is disposed of. The profit on any sale does not therefore appear in the accounts until the sale occurs. Until that time the movements of the market, whether up or down, are ignored in the accounts. This method corresponds most closely to those adopted by industrial concerns. It avoids the difficulties which are apt to occur, when market prices of unsold stock are put into the accounts and the market falls before they are ready for sale. But whatever merits this cost basis may possess very few farmers are able to adopt it, as the necessary information as to the cost is not available.

(g) *Market Basis*.—This method is customary and in many ways convenient, especially when live stock is concerned, and it will probably remain the one most frequently adopted.

The effect of putting the market price of unsold produce into the accounts is that the produce is treated in effect as if it had been sold, and the accounts show the profit at the time the valuation is put in. The profit is thus anticipated before its actual realisation, and becomes for that year a paper profit. It is probable that some farmers have been paying Income Tax on profits which are not realised profits, but which arise from the upward movement of the market. Further, it is sometimes found in practice that owing, say to corn threshing out badly, or damage being done by rats, or other similar causes, the valuation price is not realised, and in that event a loss ensues which has to be borne by the following year's account. The probability of this is of course lessened when, as is often the case, the valuation is made in a prudent and conservative manner, and temporary or abnormal fluctuations are discounted.

It will be seen that, even with the circulating assets which are intended to be sold, the insertion in the accounts of the market value of unsold produce tends to obscure the profit which is eventually realised in cash.

But whatever reasons of practical convenience may support the valuation of the "circulating" assets at market prices, the position is not the same with the valuation of the "fixed" assets. Profits thus arising from the changing values of this fixed property are not only paper profits, but paper profits arising on fixed or capital assets which must remain on the farm. The earning efficiency of these assets is unaffected by market movements; they are kept on the farm to produce, the work-horses and implements producing the crops, the breeding stock their offspring—and the dairy herd also producing milk. This being so, their efficiency as producing instruments is the measure of their value to the farm as a going concern.

In the course of the proceedings of the present Royal Commission on Income Tax, reference was made to the fact of these changing "capital" values appearing as profits in farm accounts, and it was argued that it was therefore inequitable to assess farmers for Income Tax on the amount of the profits shown by the annual accounts, as they would thereby be paying tax not only on the true annual profits from the produce sold, but also on these capital profits, to which Income Tax was not meant to apply.

(h) *Yearly Tenancies*.—It must be borne in mind that in England, at all events, most farms are let on a yearly tenancy, and with the increasing frequency with which estates are being sold and the risk of a notice to quit, it may be necessary for the occupier at short notice to realise even what have been termed the fixed assets.

It may be argued that these reasons make it unwise to assume that the farm will continue as a going concern, and that these fixed assets should, therefore, be valued in the same way as the stock, etc., intended for sale. But if for the "Fixed" Stock, cost less depreciation be adhered to as the basis, there is not much risk of a loss ensuing on realisation. Further, the great majority of farms in the past have not been subjected to interruption of their tenancies, and, in view of the promised legislation to give farmers increased security of tenure, I think the general considerations put forward above may stand.

3. **Reserves**.—At the end of the year there may be liabilities and contingencies—such as bad debts, dilapidations, decreased fertility, etc., for which it may be necessary to provide by making a reserve against the year's profit.

The necessary amount of depreciation to be written off the Live and Dead Stock (if these are not the subjects of a valuation) has also to be decided, and in practice this is often an important question.

In commercial concerns these reserves are more numerous and important than in farming.

The amount of profit to be reserved for all these purposes is largely a matter of personal opinion and prudence, or it may be, of policy, and these reserves afford a ready means of putting by secret reserves of profit and reducing the amount of profit disclosed in the accounts.

4. **Improvement Outlay and Maintenance Outlay**.—It is sometimes difficult to decide whether expenditure is in the nature of improvements or additions, or is for maintenance only.

Outlay on additions and improvements is an addition to the capital value.

Outlay on maintenance and repairs is a recurring expense which must be included in the expenses for each annual account. The dividing line, however, between the two classes of outlay is not always distinct.

Implements of improved quality or type and consequently of greater cost may be bought to replace others worn out. This may be treated in one case as a mere expense of renewal,

to be included with the other annual expenses, while in another case the part of the increased cost arising from the better quality or improved type may be regarded as an addition to the capital value of the equipment.

Again, continued high farming would add to the value of the farm, though this increasing value would not be shown in the accounts, as each year's cost of cultivations, fertilisers, etc., would be treated as expenses of the year.

5. **Household Transactions.**—Another difficulty in arriving at the final figure of profit or loss on the farm is the dovetailing of the farm transactions with those of the household and the farmer personally, owing to the extent to which the farm is used and worked by the farmer and his family.

These transactions do not involve the payment of cash, but in order to obtain accurate profit results, some at least of them should be given effect to in the accounts. Certain farmers may also desire to include with the expenses interest on the capital employed on the farm, before striking the final figure of profit.

Private income and expenditure, received and paid in cash, should always be excluded from the farm Profit and Loss Account.

It will be seen that in settling the profits quite a number of questions of principle, as well as matters of valuation and estimate and personal opinion, have to be considered, and that consequently the determining of profits is a matter of real difficulty, which affords scope for wide variation of treatment and on which honest differences of opinion may exist without improper motives or ulterior objects being imputed.

FARM COSTS.

To distinguish these cost records from ordinary farm accounts, they may be defined as the detailed records showing the cost and result of each branch of the farm, as distinct from the ordinary farm financial account, which shows the profit or loss on the working of the farm as a whole.

The usual form of farm account does not show the profit or loss of each branch of the farm. Each item of expense appears in one total without showing which branch of the farm has received the benefit, and the final figure of profit is the over-all profit of the farm as a whole. This inclusive profit

generally conceals a loss (perhaps an expected and necessary loss) on one or more departments.

How to Obtain Cost Records.—One of the main objects of cost records is to show separately the cost, and profit or loss result, of each crop and class of stock, etc., and the records are obtained as follows:—

Part of the information from which these cost records may be prepared will already appear in the financial accounts, but some additional work is necessary.

1. The various expenses are split up and charged to the branch in respect of which they are incurred. Thus wages, according to its employment, will be apportioned to the various crops, live stock, etc.

2. Effect is also given to certain transactions that do not appear in the Cash Book. These are various "internal" transactions, not involving money payment, in respect of mutual services rendered by one branch of the farm to another, *e.g.*, home-grown crops fed to the stock, labour of work horses on the crops, manure produced by the live stock for use on the land, etc.

3. Certain of the expenses (*e.g.*, for cleaning land and for certain manures), the benefit of which extends over more than one year or crop, are divided over the various crops as accurately as possible, according to the benefit which each receives. Suitable forms are used to record these "internal" transactions, the most important of which are the daily employment of the labour, and the consumption of the farm produce by the stock.

In rough, broad outlines, this is how the cost of each crop and class of live stock is ascertained. The corresponding income of each branch is known and the difference is the profit or loss. The aggregate amount of these profits or losses should agree with the over-all profit in the financial accounts.

Farm cost records require care, and while the regular records to be kept through the year are fairly simple, the closing work to get at the final cost is more difficult. The natural harmony of the rotation introduces difficulties, as does the analysis of the "internal" transactions between the different branches and the rotation course, and questions of principle arise which affect the basis of the cost records.

It must be admitted that many farmers have not the requisite time or ability to keep costs without assistance. But if, as is

hoped, groups of farmers in the near future combine to employ a clerk or accountant to keep their records, this difficulty will be overcome.

Advantages.—To enable the farmer to apply his practical knowledge in the fullest and most efficient manner, he must have the relevant facts before him, from which to adapt and vary his policy to meet the constantly changing conditions of markets, prices, seasons, etc., within the limits of his rotation.

The essential advantage of farm costs is as a means of information; they are a means and not an end. There is no virtue in the figures unless they are used. Unless they are carefully studied and the information they contain is practically applied, they are of little use. They cannot take the place of practical farming knowledge, but they enable that knowledge to be applied to the farm more fully and accurately. They bring to light the detailed inner working of each branch of the farm.

So far from stereotyping any system of farm management, they should facilitate the most elastic methods and assist in obtaining full efficiency in all the operations, and they become of increasing value when several years' costs are available for comparison.

IMPRESSIONS OF A VISIT TO DENMARK IN 1919:*

SOME COMPARISONS WITH RURAL CONDITIONS IN WALES.

S. EMILY MATTHEWS,

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Carnarvon and Anglesey Division.*

"To gather raw material for rural reconstruction" was the phrase in which Herr Lange, Principal of the Fyn Stifts Husmandsskole, described the object of our visit to Denmark. Perhaps it would be even truer to say that we went there to study Danish plans and methods of construction, and to try to understand how, from the ruins of the disastrous war with Germany, in 1864, the Danes have been able to build up a prosperous State. Of "raw material" we have as good in this country, but it is of interest to see how far the example of Denmark can be of help to us in this time of rural reconstruction.

The members of our delegation returned from Denmark with varied impressions of the agricultural methods and institutions of the country, but upon one thing we all agree—that there we found a healthy, thriving, and self-respecting rural population, making a livelihood out of the cultivation of the soil. The first thing which must strike anyone visiting Denmark is the number of clean, tidy homesteads per square mile which may be seen in every direction. My first thought, when viewing the country from the train which took us from Copenhagen to Ringsted, was—"here at any rate they grow men and women on the land"—surely the richest and most vital crop that any country can produce.

We subsequently visited many of these homesteads in various centres, and were treated most kindly by the people, who allowed us to see everything on their holdings—their cows, pigs, poultry, the crops, the farm buildings, even their kitchens and larders. What to me was more interesting than their methods or implements, however, was the fact that they and their families were able to live in comfort, if not in luxury, on the produce of 10 to 12 acres of land, and showed themselves quite happy and contented with their lot.

On one of the smallest holdings we visited, in the Island of Fyn (only 4 acres cultivated, mostly as a market garden, with a couple of cows, some poultry and pigs) the wife of the

* This article has been prepared by Miss Matthews as a result of observations made on a visit to Denmark with a delegation of women in June, 1919, with the object of studying Danish conditions in relation to women's work on the land at first hand.

holder showed us a family group in which she and her husband were seen seated amongst ten fine stalwart sons and daughters, who had all been born and bred on the holding.

The questions that were of greatest interest to me, during our brief stay, were : How is it that these men and women are contented and happy ? How is it that, though there are nowhere signs of great luxury on the one hand, there are nowhere signs of poverty or destitution on the other ?

The answer is not to be found in the richness of the soil. In the most fertile parts of Denmark there is nothing to compare with the land in the Vale of Clwyd and other Welsh valleys—indeed, there are large tracts that have only been reclaimed from barren heath or sand-dunes by the pluck and industry of the people. The climate of the country is rather worse than our own. Nor, do I think, is the answer to be found in the natural cleverness of the individual Danish farmer. Possibly the fact that agriculture is the chief industry of the country may partly account for its comparatively prosperous state, there being few manufacturing centres to which men are attracted by high wages. Still, such populous centres supply farmers in South Wales with a ready market for their produce at their very doors, whilst Denmark has to look across the North Sea for her market.

Causes of the Success of Danish Agriculture.—From what I could gather there are three outstanding factors which have made for rural development in Denmark, and have helped the Danes to realise the true meaning of "Back to the Land."

1. The most obvious factor is their *system of land tenure*—90 per cent. of the Danish farmers and small holders owning the land they farm. There is in most cases a mortgage, which is being paid off in yearly instalments over a long period,* but the owners feel a sense of security that the land is their own to make the best of, and to pass it on to their sons in better condition than they received it. They are free from the dread which has haunted many a Welsh farmer, that the rent may be raised on the tenant's improvements, or that the old home may be sold over his head.

The history of the dawn of land reform in Denmark, at the end of the 18th century, at the time when our common lands were being enclosed, and the struggle of the people for the freeing of the land during the latter half of the 19th century, would be interesting reading side by side with the history of Wales during the same period. The Danes, however, have travelled further than we have in many directions. They told

* See the issue of this *Journal* for February, 1920, p. 1061.

us "We are poor hands at revolution. We find our best way is to *prove* our rights. Thus in 1882, the only butter fit for export was that made on the big estates, and was sold for 1.42 kroner* per lb., while the inferior farm butter was sold for .88 kroner. Ten years later, after the farmers had learnt to co-operate, they were awarded all the gold and silver medals at the Dairy Show, while the estates only gained the bronze. We consider that our greatest political triumph." In the same way, the small holder tries to prove his equal right to existence by producing as good crops as the farmer.

On the larger farms we visited, which were not more than 100 acres, we found that the head man had a comfortable cottage with a neat garden, and enough land to keep a cow, some poultry and pigs. The other labourers employed were all young men up to the age of 25, putting in time and gaining more experience until they are able to acquire holdings of their own. There is thus no class of landless labourers, without prospect of anything better, or means of exit from a blind-alley profession. It is not, therefore, surprising to find that very little trouble occurs between employer and labour. These men usually "live in" as they do in Anglesey and other parts of Wales, but their quarters were neat and comfortable, comprising a sitting room in addition to their bedrooms. The wages, at the time of our visit, appeared to be very much the same as in this country.

The farm-houses are plain, mostly of the bungalow type, easily worked, fitted with electric light, and almost without exception with a telephone.

The surest proof that it is generally believed possible, in Denmark, to make a living out of 10 to 15 acres of land, is the ever increasing demand for small holdings. The demand is so great that the Bill before the Danish Parliament last summer was the third within the last 18 years having for its object the conversion of more precious acres into State small holdings.

2. The second factor is undoubtedly the wonderful system of *co-operation* in Denmark, which makes it possible for the small producer to make a living in competition with the larger farmer. The first co-operative dairy was started in 1882; there are now 1,188 such dairies in Denmark, with a membership of 157,000. The first bacon factory was started in 1887; there are now 41 societies, with a membership of 95,000. The most interesting fact in connection with these societies is that the movement was started entirely by the farmers themselves, and was not the work of organisers. It has proved so success-

* A kroner = 1s. 1½d., normal rate of exchange.

ful that the same principle of co-operation is applied to almost every branch of farming. We visited several dairies, egg-collecting stations, and a bacon factory. All produce is carefully graded, and great care is taken to maintain a high standard. We were told at the egg-collecting station that any member who has sent in an egg which is not fresh is warned after the first offence ; for any subsequent offence he is fined 6s. per egg. Every pig brought to the bacon factory is examined by an expert, and must be absolutely free from any trace of disease, or it cannot receive the red export stamp. The Danes are careful to study their market, and to produce articles for which there is the greatest demand. For instance, we found that pigs intended for England were reared and fed quite differently from those intended for Germany. We were told, " You do not like your bacon so fat as the Germans do."

One effect of the co-operative movement has been materially to relieve the strain upon those who are the most overworked members of a farmer's household in this country, namely, the womenfolk.

The question occurred to me : " Why has not this same system been more generally adopted in Wales ? " Those who have started cheese factories and egg or vegetable collecting stations know the up-hill work that is necessary and the prejudice, jealousy, and ignorance that have to be fought and overcome before these societies can flourish.

3. In the opinion of the most intelligent men we met, it is the third factor, *the Folk High Schools*, which has made co-operation possible, by widening the outlook of the peasants and giving them a sense of comradeship and mutual trust.

The Danes and the Welsh have two traits in common—they are characterised by an intense love for their country, and among all classes is found a passion for education and culture. We in Wales are proud of our intermediate schools and University Colleges, which have been built by the efforts of the people themselves—miners, quarrymen and labourers all contributing their bit. What has been the idea behind it all ? Has not the labourer looked for some door through which his son, if intelligent, may escape from the land and take up some other profession ? The boys and girls from our intermediate schools and colleges do not often return home feeling that it is a fine thing to till the soil. In Denmark, in addition to secondary schools and colleges for those who wish to take up a scholastic career, they have a quite different type of schools, the Folk High Schools, and their offspring, the schools for small holders. These schools provide three or five months' courses

for those, who, having left school at the age of 14 or 15, and having lived at home for four or five years, helping on the farm, have come to feel that they want further instruction and inspiration.

In order thoroughly to understand these schools, we must go back to the history of their inception and the ideals of their founder, Bishop Grundtvig, who lived in the early part of the 19th century. His ideal was the establishment of a truly national school, which would arouse in the students a wish to make their country a good country, not only for the individual, but for all Danes. His theory was first put into practice in 1850, but it was not until 20 years later that the Folk High Schools took their hold upon the nation.

The main principles which Grundtvig laid down were:—

1. That the schools should be for adults, no one to be admitted under the age of 18.
2. That the pupils should live together at the schools for the few months they attend the course, thus acquiring a sense of unity and mutual trust.
3. That they should be taught by the "living word," that is, words of deep conviction, from the heart, and having an influence on the lives of others: no mere book learning, and no examinations.
4. That the chief subject taught should be the history of the development of Denmark, and the building up of the life of the nation, linked up with the history of the peoples of the world.
5. That the attendance should not be compulsory nor entirely free.

There are now over 80 high schools, a number of agricultural schools and 3 schools for small holders. In all cases they have been founded by private or co-operative enterprise, and must be able to show two years' successful working before an application for State grants will be considered. Scholarships, covering three-fifths of the cost of the course, may be obtained, the students being allowed free choice of any school in the kingdom, and not restricted to those in their own district or county. This, we were told, has a very healthy effect on the schools, as under this system an unsatisfactory school dies a natural death for lack of pupils, and the best schools grow rapidly.

During our stay in Denmark, we visited several Folk High Schools, and agricultural schools, and stayed at two schools for small holders, where cultural subjects are taught along with the practical and more technical subjects. While at these schools we tried to live the life of the students, and to get as far as possible their point of view. We were there during the summer months when the course is for young women—the

men attend during the winter. The first lecture, at 8 a.m., was either Danish literature or history, followed during the day by lectures on hygiene, food values, the planning of the home, the best way to lay out the garden, and the history of the development of the land laws, and of the struggles through which the privileges they now enjoy had been won. During the morning they split up into companies, taking, in rotation, practical cookery, dressmaking, embroidery, gardening and poultry-keeping. The cookery lessons teach the best use of such food as can be produced on a small holding. An hour is devoted to gymnasium every afternoon, and after supper the day is concluded with singing, or, when the weather is fine, with games and country dances in an open space in the grounds, in the centre of which is a tree planted to commemorate the granting of suffrage to Danish women.

In addition to the summer and winter courses for young men and women, special eleven-day courses are arranged for small holders and their wives. Practical demonstrations are given, and the lectures are made as simple as possible. The meaning and effect of newly-made laws, and the contents of reports of experimental farms and official publications are explained in a clear and concise way, so that considerable time and labour of reading are saved to the small holder.

We asked the sons and daughters at most of the farms we visited what high school they had attended, and in no case were we told they had not been to one.

The aim of these schools is not to turn out scholars (for advanced scientific courses agricultural students must go to the colleges), but rather to help the ordinary people in their everyday life, and to make them better citizens. The chief object of the instruction appears to be the building up of the rural home life, to give those who live in country districts a wider outlook, and to remove prejudice and mutual distrust. The students return home with fresh inspiration for their daily tasks, and instead of regarding the country as "dull," as many of our young people do, they find their work full of interest, and are determined to overcome difficulties and to make the best of their few precious acres.

They also take a greater interest in the communal life of their native village, and start gymnastic clubs, literary and debating societies, and choral unions. In fact, these schools supply to the national life of Denmark the same element as the Eisteddfod does in Wales; they are animated by the same spirit, and are, at the same time, an inspiration and an expression of the soul of the people.

THE MANAGEMENT OF BULLS.

THE following notes on the care and treatment of a bull have been prepared as a guide to farmers who have had little or no experience of keeping a high-class sire, and especially for those who are custodians of bulls under the Live Stock Scheme of the Ministry.

The bull has been said to be "half the herd." If he is to get strong, healthy calves and prove a good investment he should receive better treatment and attention than the ordinary stock on the farm.

Many bulls are housed and specially fattened for sale, and when such animals are purchased it is advisable that they should be rested and carefully fed for the first few days after arrival, until they have recovered from the effects of the journey and have grown accustomed to a new attendant and a change of diet. During this period sweet hay, linseed cake, and bran are recommended as suitable food for a bull, but after about one week he should be gradually accustomed to whatever food it is intended to give him. Over-feeding a newly-purchased bull with too much concentrated food, or under-feeding with the idea of reducing his condition, are equally dangerous.

Feeding.—The idea that bulls will prove unfertile or lazy unless they are kept in lean condition is entirely wrong. To obtain strong, healthy calves it is necessary that the bull used should be in good condition and that he should be allowed plenty of exercise.

From 4 to 6 lb. per day, according to age, of cake or other suitable concentrated food is none too much to give a bull in addition to a fair allowance of roots and plenty of hay in the late autumn, winter and early spring, and of cut grass or other green food during the remainder of the year.

Regularity in feeding is most important. The times when a bull is to be fed should be fixed by the owner and strictly adhered to.

Before feeding an animal it is important to remove any food which may remain from the previous meal, and, as far as possible, an animal should not be given more at one meal than he is able to "clean up." The bull should always have free access to clean, fresh water. Where this is not possible he should be offered water twice daily.

The Attendant.—Bulls should be fed, attended to and exercised by a careful man; they should be treated kindly and on no account should they be teased, or they may develop vicious habits.

Every bull exceeding one year old should have a ring in his nose, and, for leading, a strong staff of an approved pattern should be used.

The hoofs should be kept short and the soles flat, either by exercise on a hard road or by paring them with a suitable instrument, otherwise the animal cannot stand, walk or serve properly.

It is advisable to brush and groom the bull regularly, and an occasional wash with soap and water is beneficial, to prevent vermin. Should vermin appear the animal should be twice washed with water to which a suitable disinfectant has been added. The second wash should follow the first after an interval of a week. A wineglassful of "Jeyes" fluid to a gallon of water is a suitable solution for the purpose.

Housing.—The bull should have proper shelter from the cold in winter and from the heat in summer.

To secure this it is advisable to keep him in a loose box (about 12 ft. by 12 ft. in size) well lighted and ventilated, but not draughty, attached to which should be an open yard, about twice the dimensions of the loose box, to which the bull should have access. The floor of the loose box and yard should be paved. Every morning the dung and soiled litter should be removed from the box, fresh litter supplied and the open yard swept clean.

Although on many farms a loose box and open yard as described are not available, it is generally possible to find a loose box in which a bull can be kept. On no account should a bull spend his life tied up by the neck and cramped in a stall which is often dark and dirty.

Exercise.—Plenty of exercise helps to maintain health and vigour. During winter, or when confined to the house, bulls should be led out for regular exercise: about one mile every other day is recommended.

In summer a run in a paddock may be permitted at night.

Service of Cows.—The practice of turning a bull loose among a herd of cows is not to be recommended. This often leads to him serving a cow repeatedly until both bull and cow are exhausted, and there is a danger of the bull becoming unfruitful and of the cow not proving in calf.

If a cow is in proper season one thorough service is all that is necessary. Double service should not be allowed: it is apt to reduce the constitution and condition of the bull, and it tends to diminish the number of cows he can effectively serve in one season and to shorten the period during which he is suitable for stock purposes.

Care should be taken that a young bull does not serve too many cows during a short period, especially when first used for service, or he will become stunted and lose his vigour, and possibly become temporarily or perhaps permanently unfruitful.

Prevention of Abortion.—There is a danger of bulls being the means of spreading abortion, and owners should therefore enforce strict adherence to the Regulations of the Ministry as set out in the Model Rules for a Bull Society (L²), which are framed to prevent the spread of this disease.

(This Article is also issued by the Ministry as Leaflet No. 342.)

AGRICULTURE ABROAD.

"FARMERS' WEEK" IN MISSOURI—AGRICULTURAL EDUCATION
IN CANADA—AGRICULTURAL CREDIT IN ALSACE-LORRAINE.

In January last a somewhat novel agricultural function, styled by its promoters "The Farmers' Week," was arranged to be held at the University of Missouri in America. The arrangements were planned by the University and the State Board of Agriculture, with the co-operation of the agricultural associations, and the object was to bring together the farming community of the State with a view to assisting in the spread of a knowledge of farm husbandry, and to give farmers an opportunity of discussing among themselves, and generally widening their outlook upon, matters connected with their industry. The primary object of the "Farmers' Week" was educational, but the social and recreative side received a large share of attention. The main features of this gathering were outlined in a programme issued by the University, extending an open invitation to all farmers of the State.

It was stated in the programme that farmers were to be allowed full facilities for inspecting the college equipment, laboratories, libraries, and classrooms, and the college staff and students would be available to lend their assistance in helping the farmers in every way possible. Nine special short courses of lectures were arranged daily under the direction of the University College of Agriculture, and included such subjects as live stock, dairying, poultry, horticulture, bee-keeping, soils and crops, and farm and home economics. Agricultural association meetings and a general Rural Life Conference were also to be held every day. The annual State Corn and Grain Show and the University Live Stock Show were special features of the programme. An Information Booth was to be erected on the premises, and farmers were requested to register at this booth on their first arrival at the University grounds, and receive the official badge. A publication entitled *The Daily Announcer* was to be distributed from this booth every afternoon.

With regard to the social side, entertainments were arranged as a regular evening feature, and contests, games, instruction and entertainments were provided for the boys and girls. A special programme was drawn up for farm women. To con-

clude the proceedings a farmers' banquet was arranged for the last evening, given by the University to visiting farmers.

In arranging such a social function as the "Farmers' Week" the agricultural authorities of Missouri have certainly taken a practical step in fostering the farm interests of the State. The idea might well commend itself to those at home interested in the development of agriculture by increased social intercourse.

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THE place of the agricultural college and its importance to the future in promoting the interests of

**Agricultural
Education in Canada.**

agriculture in Canada was the subject of a series of articles in the issue of the *Agricultural Gazette of Canada* for January last. Emphasis was laid on the importance of specialised education as a means of developing the industry, and of the responsibility resting upon the colleges for equipping their students with a training that will enable these men to take a place in the foremost ranks of human progress and achievement. It is expected that these institutions will not only fit men for farm callings, and turn out teachers, administrators and highly-trained investigators, but that they will instruct their students in the social sciences as applied to agriculture in order to qualify them to give instruction on questions of this character. Briefly, it is recognised that their function is to prepare young men both for vocational agriculture and for the proper discharge of their duties as citizens.

From Ontario westward, every province of the Dominion has now an agricultural college, established and maintained at the public expense, for the purpose of preparing men to become either practical and scientific farmers, or instructors, investigators and leaders in all matters connected with agriculture.

In the east of Canada a similar service is being rendered by the Macdonald College, an institution established as a private bequest, but receiving aid from the public treasury, and by the Agricultural College at Truro, Nova Scotia, the latter serving the needs of the Maritime Provinces. Quebec province has, in addition, two institutions designed to afford instruction in agriculture to French-speaking Canadians.

Agricultural education in Canada received a stimulus in 1912, in the passing of the Agricultural Aid Act. This measure placed moneys at the disposal of the provinces for the benefit of agriculture. It had been felt that a portion of the fund

should be devoted to increasing the efficiency of the agricultural colleges, and certain allocations were accordingly made under the Act for this purpose. In each province except Saskatchewan this preliminary grant was devoted to building, extension and improvement of the colleges.

In 1913-14 the original Act was superseded by the Agricultural Instruction Act. The policy of assisting the agricultural colleges has been continued, and a number of colleges and schools have been erected in the various provinces participating under the new Act. Since the passing of the Agricultural Instruction Act a total sum of \$1,890,143 (£393,780 at normal rate of exchange) has been allotted to the colleges and schools of these provinces.

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A REVIEW was published in the *International Review of Agricultural Economics* for March last of a note communicated by M. A. Laugel to the annual general meeting of the Société d'Economie Sociale on the subject of co-operative credit in Alsace-Lorraine. The information it contains furnishes an interesting example of the system of agricultural banks which has become popular in certain parts of the Continent to provide credit facilities to deserving rural workers who may be handicapped in their farming operations owing to lack of capital.

About the year 1880, it was decided to establish an agricultural credit bank of the Raiffeisen type in Alsace-Lorraine. The object of these banks, as is generally known, is to encourage the wealthier section of the rural population to place money on loan on good security, for the use of farm workers who may be in need of temporary financial assistance, to enable them to extend their farming operations.

Very satisfactory results attended the first years of the movement. Country districts were able to free themselves from the practices of usury which had been preying on them, and the system of credit was placed on a more healthy basis. The Raiffeisen banks were unlimited societies, and their members had thus an interest in watching the progress of their business and trusting only in men on whom they could rely.

With the development of this system of credit, federations of banks were formed which grouped themselves into larger units. Just as in the initial stages of the movement the more wealthy villagers lent money to the poorer inhabitants, so it gradually became the practice for the banks with the largest

resources to make advances to the smaller banks. Such transactions were carried out through the medium of a central agency, which received and distributed surplus funds. This agency also possessed the right to decide the use to which the money should be put.

The organisation spread through Germany, and eventually was divided, in every German state, into two distinct, but closely united, sections. The first section comprised departments of inspection, auditing, advertisement and technical instruction, and aimed at spreading among agriculturists a knowledge of the principles of farm husbandry.

The second section dealt with questions of finance. It served the purpose of a large bank, in which were centralised the funds of the subsidiary banks. In addition to arranging credit facilities, it also carried on an important trade in machinery, manures and supplies of all kinds, which were bought wholesale, and could, therefore, be resold on the best possible terms.

The extent to which Raiffeisen Banks have developed in Alsace-Lorraine is well shown in the fact that there are now over 470 of such banks in the country.

Another institution was set up by the Government of Alsace-Lorraine some thirteen years ago, owing to special circumstances, to compete with the Raiffeisen Banks. It was formed on much the same model as the Raiffeisen Banks, and, as in the case of these banks, was divided into two sections. By the assistance of the Government the new institution has prospered, side by side with the Raiffeisen Banks. Its organisation now includes 228 savings and loan banks, and some 60 miscellaneous associations engaged in agricultural work, and according to the balance sheet for 1917 it has collected about 26 million francs (normally more than £1,000,000), which are invested in loans to communes or in movable property.

QUESTIONS IN PARLIAMENT.

Home-grown Wheat.—In reply to a question by Captain Terrell, the Parliamentary Secretary to the Ministry stated the method by which it was proposed that the price to be paid for home-grown wheat harvested in 1920 should be ascertained.

The price to be paid for British wheat of sound milling quality would be announced each month, and would be the average of the c.i.f. cost of all milling wheat imported during the two preceding months, and of the actual and anticipated arrivals in the United Kingdom during the current month, subject to an adjustment in respect of the lower percentage of flour of equal water content obtainable from home-grown wheat as compared with imported wheat, and subject also to a maximum of 95s. a quarter. Home-grown wheat of sound milling quality would be defined as wheat of fair average quality for the season fit for milling into flour for human consumption.

In reply to the specific inquiries in the question, the term "similar or comparable quality" refers to the percentage of flour obtainable, and the prices would be adjusted accordingly. Consequently, in view of the fact that British wheat yields on the average a somewhat lower percentage of flour of equal water content than imported wheat, the maximum price of 95s. would be payable for British wheat so long as the average price of imported wheat was in excess of that figure. (19th April, 1920.)

Wheat Prices.—In reply to a question by Mr. H. Gritten, the Parliamentary Secretary to the Ministry stated that the average c.i.f. cost of all wheat imported during the financial year ended 31st March last was 94s. per 480 lb. The estimated average c.i.f. cost for the current month (*i.e.* April) is 104s. per qr. of 480 lb. The estimate for the bread subsidy for the current financial year recently submitted was £45,000,000. So long as the bread subsidy continues it was impossible to decontrol wheat, but it had already been announced* that higher prices would be paid to farmers for home-grown wheat harvested in 1920 and 1921. (22nd April, 1920.)

Spring Wheat.—In reply to a question by Capt. Terrell, the Parliamentary Secretary to the Ministry stated that no definite information was available in regard to the area sown with spring wheat, but from reports received the total area under wheat this year was considerably less than in 1919 and 1918. (13th April, 1920.)

Agricultural Bill.—In reply to a question by Captain Terrell, the Parliamentary Secretary to the Ministry stated that he was aware that the agricultural industry was anxiously awaiting the introduction of the Agricultural Bill, and the Ministry had received a number of resolutions on the subject from local branches of the National Farmers' Union and other bodies. He hoped, however, to be in a position to introduce the Bill at an early date. The reasons for the delay were the necessary reconsideration of certain aspects of some of the Clauses of what was a somewhat complicated and technical Bill. (22nd April, 1920.)

* See this *Journal*, March, 1920, p. 1153.

Land Settlement.—In reply to a question by Captain Coote, the Parliamentary Secretary to the Ministry stated that the number of men settled on the land in England and Wales under the Land Settlement (Facilities) Act, 1919, was as follow :—

Number of men actually settled (civilians and ex-service men)	5,794 on 79,631 acres.
Total acreage acquired, or agreed to be acquired, by the County Councils with the Ministry's approval	187,590 acres.
Average cost of land per acre	£41 4s.
Number of applications outstanding (ex-service men and civilians) :—	
Approved and awaiting land	20,060
Waiting interview, and standing over	10,890
	<hr/> 30,950

Loans guaranteed (figures only available up to 31st December, 1919) 10 for a total of £1,575.

He added that full information had not yet been received from the Councils as to the terms (including rent) on which the holdings had been let to those men already in occupation. Moreover, certain questions of equipment were still outstanding, and it was, therefore, not possible at present to supply precise information.

He further stated that in addition to this the Ministry had acquired 28,294 acres for the purposes of farm settlements, and that out of a total of 1,891 applicants, 697 had been approved, and of these 511 men were already settled. Forty-eight applicants were awaiting interview. The remaining applications had either been withdrawn or rejected. (19th April, 1920.)

The Titchfield Farm Settlement.—In reply to a question by Mr. R. Young regarding the Titchfield Farm Settlement, the Parliamentary Secretary to the Ministry stated that the area of this Settlement was 1,392 acres, and that the purchase price was £55,800. At present 230 acres were let to 76 ex-service men, the rent being £4 per acre for the first year and £5 per acre subsequently. The rents paid by small holders previous to the property being purchased by the Ministry varied in amount, but averaged about £3 per acre. This rent was paid for the bare land which the tenants had themselves to clear and get into good order. The Ministry was getting the land into thoroughly good order before letting it, and was also providing facilities for the hire of horses, implements, etc. Demonstration plots were also being established. In view of these advantages and the increased rate of interest now existing, it had been found necessary to fix a higher standard of rent. (14th April, 1920.)

Agricultural Wages.—In reply to a question by Captain Fitzroy, the Parliamentary Secretary to the Ministry stated that the impending rise in wages of 4s. was anticipated and taken into account when the recent announcement with regard to wheat prices was made. If it should become necessary to revise these prices in the future, due consideration would be given to any variations in the cost of production. (19th April, 1920.)

County Agricultural Committees.—In reply to a question by Captain Coote, the Parliamentary Secretary to the Ministry stated that schemes for the formation of County Agricultural Committees had been received,

some in draft, in the case of 46 County Councils up to the present. Fourteen had been finally approved, and in one case the Committee was complete and were to hold its first meeting this week. In 13 cases the appointment of the committee was still proceeding. In the case of the remaining 32 schemes, 21 have been provisionally approved and 11 were now under consideration. In the case of 16 Councils, no scheme had yet been submitted. (19th April, 1920.)

Grading of Hay.—In reply to a question by Sir H. Nield, as to the grading of hay by the Government, the Secretary of State for War stated that the grading of hay by the Government ceased with the purchase of the 1918 crop. The grading was carried out by officers of the Forage Department and by duly appointed buyers from the hay trade whose names were recommended by the Civil Supplies Central Council. He was informed that, as far as was known, there had been no complaints as to the grading. (16th April, 1920.)

Forage County Distributing Committees.—In reply to a question by Captain Terrell, the Parliamentary and Financial Secretary to the War Office stated that the distribution of the 1918 crop of hay and straw was dealt with by the County Distributing (Forage) Committees, and they were at present carrying out duties only in so far as the winding up of the organisation is concerned. (15th April, 1920.)

Agricultural Rates Act.—In reply to a question by Mr. Cautley, the Minister of Health (Dr. Addison) stated that the present amount of the annual grant to be paid into the Local Taxation Account under the provisions of the Agricultural Rates Act, 1896, is £1,323,827: in 1897, the amount was certified at £1,331,034. The total amount of rates, to which the Act applies, collected in respect of the year ended March, 1897, for the spending authorities referred to in the Act was £20,800,000. The corresponding figure for 1917 (the latest year for which the returns are complete) was approximately £47,800,000. Only a small proportion of the total relates to agricultural land. (29th March, 1920.)

Agricultural Machinery.—In reply to a question by Major J. Edwards, the Parliamentary Secretary to the Ministry stated that the recommendations of the Committee on Agricultural Machinery were now under consideration by the Ministry. The Ministry hoped to be able to obtain financial sanction for early action on certain of the proposals. No legislation would be required to give effect to the recommendations. (21st April, 1920.)

Foot-and-Mouth Disease.—In reply to a question by Captain Terrell, the Parliamentary Secretary to the Ministry stated that according to the latest information in the possession of the Ministry there was reason to believe that Foot-and-Mouth Disease existed or had recently existed in every country of Europe, with the probable exceptions of Norway, Sweden and Denmark. Many of the returns were, however, not of recent date, and no records of any kind were available in the case of Russia and 9 other European countries. In spite of every inquiry the origin of disease in the recent outbreaks remained obscure.

A Committee of Scientists has recently been appointed to investigate this disease, and it is hoped that its researches will commence shortly. (21st April, 1920.)

NOTICES OF BOOKS.

Flax Culture and Preparation.—Professor F. Bradbury (London : Sir Isaac Pitman & Sons, Ltd., 1920, 9s. net). This book has been prepared with the object of supplying information on the cultivation of flax for fibre and the subsequent processes of handling the harvested crop for use for textile purposes. It is styled “A concise and complete description of the process of flax cultivation from the selection of seed to the preparation of flax for the market.” In the opening chapters the characteristics and composition of flax fibre are stated, and information given as to the germination, weight and purity of the seed, methods of testing seed for weight, moisture, and moisture in hot air, and various sources from which seed is obtained from abroad, including Russia and Holland. Following on the principal considerations in the selection of seed the questions of climate and soil, and manures most suitable to the growth of the crop, are discussed. Chapters are then devoted to the preparation of the land, sowing, weeds and weeding, harvesting, and saving the flax seed. The remainder of the book deals with the operations of deseeding, retting and scutching the flax. To those interested in the question of marketing flax the concluding short chapter on the system of weights and money values in foreign flax-producing countries may be useful. The volume, of 154 pages, contains a number of illustrations, both in the text and in the form of plates.

Co-operation in Denmark.—L. Smith-Gordon and C. O'Brien (Manchester : Co-operative Union, Ltd., 1919, 2s. 6d.). This volume is one of a series of books, each dealing with co-operation in a particular country, issued by the Publications Department of the Co-operative Union. The present volume contains a description of the origin, growth, organisation and results of co-operation in Denmark. In that country, as is well known, co-operation is the foundation of national prosperity. Agriculture, the chief industry, is co-operatively organised from beginning to end, and in the towns, as in the villages, the co-operative spirit finds expression in a variety of ways. Danish co-operative creameries and credit banks have served as models to be copied by agriculturists in other countries, and the book shows that the value of the contribution made to co-operative thought by Danish co-operators is very great.

First Report of the Departmental Committee on the Wholesale Food Markets of London (Cmd. 634. London : H.M. Stationery Office, 1920, price 1d. net). This Committee was appointed by the Food Controller to consider and report whether the existing wholesale markets for food in London were adequate, economical in their working, and efficient in their administration ; to consider the influence of wholesale market facilities on food prices ; and to report what steps, if any, could usefully be taken in order to effect an improvement in the wholesale distribution of food by means of public markets. The evidence received indicated to the Committee that, in the case of some of the markets, improvements and extensions were urgently required which could not be carried out under their present ownership and management, and that in the case of other markets the question of removal ought at once to be considered. The Committee therefore felt it desirable to present an Interim Report in order that this matter might receive early consideration.

The recommendation of the Committee, with the exception of one member, are :—

- (a) that market facilities ought to be administered not in the interest of private owners or of separate Local Authorities, but in the public interest.
- (b) that full legal powers and full financial resources should be made available for that purpose.
- (c) that the administration of these powers should be vested in one Central Authority for the whole of Greater London.

This Central Authority should have power, *inter alia*, to acquire compulsorily land and other property ; to raise funds necessary for the purchase of existing interests, or for the establishment of new markets to close existing markets, or to remove them to more suitable sites, and to make provision for any questions of compensation that may arise in connection therewith ; to fix tolls, rents and other charges payable by users of the markets ; and to erect and maintain any subsidiary buildings or undertakings for the benefit of such markets, such as cold storage, or other warehouse accommodation, and plant and equipment for the manufacture of ice, and the utilisation of market refuse, waste material, etc.

It is recommended that (c) should be adopted without delay, and that a Market Authority covering approximately the area known as Greater London should be established to exercise the powers and functions outlined.

An appendix is added to the Report, giving a list of wholesale food markets in London.

Report of the Tropical Agricultural College Committee.—Cmd. 562 (London : H.M. Stationery Office, 1920, 2*d.* net). This Report contains the findings of the Committee appointed by the Secretary of State for the Colonies in August last to consider the desirability of establishing a Tropical Agricultural College in the British West Indies. The Committee was unanimously of opinion that steps should be taken to found a Tropical Agricultural College in the British West Indies, and recommends, after giving careful consideration to the question of locality, that it should be established at Trinidad.

In the opinion of the Committee there is a great need in the West Indies for scientific investigators and advisers, and also of a body of British expert agriculturists well versed in a knowledge of the cultivation of land in the tropics, to develop the resources of the Islands. It lays emphasis on the view that the establishment of such a College is a matter of Imperial concern.

It is recommended that the staff of the College should include teachers with the status of Professors in the subjects of general agriculture, mycology, entomology, agricultural chemistry, organic chemistry, agricultural bacteriology, agricultural and physiological botany, genetics, sugar technology, and agricultural engineering and physics, and teachers with the status of Lecturers in stock and veterinary science and book-keeping.

The Report contains a number of recommendations as to the type of College needed and other matters included in the terms of reference.

MANURIAL VALUES OF

CORRESPONDENTS frequently ask for information as to the manurial farmers may have such information available for easy reference the No. 73 of the University of Leeds and the Yorkshire Council for Agriculture and Voelcker's Tables have already been published in this

MANURIAL INGREDIENTS.									
Food.	PER TON.				PER CENT.				Estimated Value of Manure ³ produced by Consumption of One Ton of the Food (allowing half the Nitrogen, and three-quarters each of the Phosphoric Acid, and Potash). (Hall & Voelcker's Method.)†
	Nitrogen.*	Phos- phoric Acid† (P ₂ O ₅).	Potash (K ₂ O).	Lime. CaO).	Nitrogen.*	Phos- phoric Acid† (P ₂ O ₅).	Potash (K ₂ O).	Lime (CaO).	
lb.	lb.	lb.	lb.	per cent.	per cent.	per cent.	per cent.	£ s. d.	
Cottonseed Cake—Decorticated	155	70	36	7	6.9	3.1	1.6	.3	2 13 3
" " Undecorticated	83	56	36	7	3.7	2.5	1.6	.3	1 12 7
Linseed Cake	106	38	29	9	4.7	1.7	1.3	.4	1 16 0
Hemp Seed Cake	100	56	31	9	4.5	2.5	1.4	?	1 16 10
Rape Cake	112	45	29	15	5.6	2.0	1.3	.7	2 2 0
Earthnut Cake, Decorticated	168	29	33	4	7.5	1.3	1.5	.2	2 12 6
" " Undecorticated	107	22	25	4	4.8	1.0	1.1	.2	1 14 4
Coconut (Copra) Cake	76	33	44	11	3.4	1.5	2.0	.5	1 9 10
Palm-kernel Cake	63	24	11	7	2.8	1.1	.5	.3	1 0 9
" " Meal, Extracted	67	27	11	7	3.0	1.2	.5	.3	1 2 2
Soya Bean Cake (Soya Cake)	154	49	40	6	6.9	2.2	1.8	.3	2 11 8
" " Meal, Extracted	161	51	42	6	7.2	2.3	1.9	.3	2 14 0
Soya Beans	128	22	29	4	5.7	1.0	1.3	.2	2 0 4
Linseed	86	32	24	7	3.6	1.4	1.1	.3	1 8 1
Dried Yeast	172	123	45	7	7.7	5.5	2.0	.3	3 4 7
Locust Beans	23	11	15	?	1.0	.5	.7	?	0 9 3
Wheat Middlings (Fine Pollards)	54	31	18	1	2.4	1.4	.8	.05	1 0 0
" " Sharps (Coarse Pollards)	56	58	31	2	2.5	2.6	1.4	.1	1 5 1
" Bran	54	60	33	4	2.4	2.7	1.5	.2	1 5 0
Oatmeal	54	54	33	2	2.4	2.4	1.5	.1	1 4 4
Maize Germ Meal	47	20	30	2	2.1	2.4	1.3	.1	0 18 6
Gluten Meal	136	7	1	1	6.1	.9	.05	.05	1 17 6
" Feed	85	15	4	2	3.8	.7	.2	.1	1 5 0
Rice Meal	47	56	15	2	2.1	2.5	.7	.1	1 0 4
Malt	38	18	11	2	1.7	.8	.5	.1	0 13 6
Malt Dust or Combs	85	40	45	4	3.8	1.8	2.0	.2	1 12 11
Brewers' Grains (Wet)	19	9	1	2	.85	.4	.05	.1	0 0 2

VARIOUS FARM FOODS.

ingredients of the different feeding stuffs in ordinary use. In order that following table of manurial values of various farm foods, issued in Bulletin cultural Education, and prepared by Dr. C. Crowther, is here reprinted. *Journal* for January, 1915, p. 931.

	72	36	4	9	3.2	2.6	.2	.4	1	3	0	1
Brewers' Grains (Dried)	..	..	..	..	..	..	..	..	..	..	..	..
Distillers' Grains (Dried)	..	..	..	..	..	..	..	..	..	..	..	..
Molasses	90	34	4	9	4.0	1.5	.2	.4	1	3	0	1
Meat Meal	33	1	56	7	1.5	.05	.25	.3	0	19	0	0
Fish Meal	257	7	2	9	1.5	.7	.1	.4	3	11	0	0
Wheat ..	199	193	25	157	8.9	8.6	1.1	7.0	3	16	0	7
Barley ..	..	..	13	1	1.8	.9	.6	.05	0	14	7	0
Oats ..	36	18	13	1	1.6	.8	.6	.05	0	13	6	0
Rye ..	43	15	11	2	1.9	.7	.5	.1	0	14	6	0
Misc ..	20	13	13	1	1.8	.9	.6	.05	0	14	7	0
Maize ..	38	13	9	1	1.7	.6	.4	.05	0	12	9	7
Beans ..	90	27	29	2	4.0	1.2	1.3	.1	1	10	7	0
Peas ..	81	20	22	2	3.6	.9	1.0	.1	1	6	7	0
Straw—Wheat	..	4	18	4	.35	.2	.8	.2	0	5	0	9
Barley ..	11	4	24	7	.5	.2	1.1	.3	0	6	0	9
Oat ..	11	4	33	9	.5	.2	1.5	.4	0	8	0	0
Rye ..	10	4	20	6	.45	.2	.9	.3	0	5	10	7
Pean ..	31	9	42	27	1.4	.4	1.9	1.2	0	10	7	0
Meadow Hay ..	33	9	36	22	1.45	.4	1.6	1.6	0	12	4	0
Seeds " Hay ..	43	13	40	44	1.9	.6	1.8	2.0	0	15	4	0
Pasture Grass ..	11	3	13	9	.5	.15	.6	.4	0	5	2	2
Clover (Green) ..	13	3	11	11	.55	.15	.5	.5	0	5	2	2
Vetches (") ..	13	3	11	11	.55	.15	.5	.5	0	5	2	2
Lucerne (") ..	14	3	9	20	.65	.15	.4	.9	0	5	7	0
Cabbage ..	10	3	9	4	.45	.15	.4	.2	0	3	11	7
Rape ..	10	3	7	4	.45	.15	.3	.2	0	3	11	7
Turnip Tops ..	8	3	4	9	.35	.15	.2	.4	0	3	11	7
Turnips ..	4	2	7	1	.2	.1	.3	.05	0	2	3	3
Swedes ..	4	2	7	1	.2	.1	.3	.05	0	2	3	3
Mangets ..	4	2	11	1	.2	.1	.5	.05	0	2	4	4
Carrots ..	4	2	7	3	.2	.1	.3	.1	0	2	11	7
Sugar Beet ..	4	2	9	1	.2	.1	.4	.05	0	2	7	0
Potatoes ..	7	3	13	1	.3	.15	.6	.05	0	2	7	0
Silage—Alfalfa Grain and V. fol.)	15	6	22	9	.35	.2	1.5	.15	0	3	11	5
Milk—Cow (Whole) ..	..	..	..	..	..	..	1.0	.4	0	7	..	..
" (Skim) ..	..	..	..	..	..	..	.5	.4	0	7	..	..
" (Separated) ..	..	..	..	..	..	..	.2	.15	..	..	..	..
Whey ..	..	..	..	..	..	..	.1	.1	..	..	..	..

* To get approximately the equivalent amounts of Ammonia increase by one-fifth.

† Phosphate of Lime multiply by 2½.

‡ In calculating these manurial values the unit prices adopted by Hall and Voelcker in their first paper (*Journal of the Royal Agric. Soc.*, Vol. 63, 1902, p. 108) have been employed, viz. — = 12s. (= Ammonia at 9s. 10½d.).

Nitrogenic Acid = 3s. (= Phosphate of Lime at 1s. 4½d.).

Phosphoric Acid = 4s.

Lime is not taken into account.

§ To adjust roughly to present (1919) higher unit prices of manures, multiply by two "Value of Manure" given in this column.

Weather Forecasts for Farmers.—The Meteorological Office will, as in past years, supply forecasts of weather by telegraph to persons desirous of receiving them, upon payment of a registration fee of 1s. and the cost of the telegrams, computed at 1s. per message.

The forecasts are drawn up at 10.30 a.m., 4.0 p.m., and 9.0 p.m. (summer time). Forecasts issued at the morning hour refer to the period covering the afternoon of the day of issue and the morning of the following day. Those issued in the afternoon and evening refer to the whole of the following day. All the forecasts include a Further Outlook of the probable weather beyond the 24-hour period whenever such a Further Outlook can be given.

Notifications will also be issued by telegram when conditions indicate that a spell of several days fair weather is likely, and again when the spell is about to break up. For this service a fee of 6d. is charged for each telegram despatched, in addition to the Post Office charges for telegraphy. A minimum deposit of 5s. against which the charges may be booked is required.

Applications for regular forecasts (as distinct from Spell Notifications) should specify the hour of the forecasts desired (or hours if more than one telegram daily is required). They should be sent to the Director, Meteorological Office, Air Ministry, London, W.C.2, and should be accompanied by a cheque or postal order payable to the Meteorological Committee to cover the cost of the telegrams for the period during which the forecasts are to be sent.

Further particulars and printed forms of application may be obtained from the Director of the Meteorological Office.

Applications by telegraph for single forecasts should be addressed to "Weather, London," and the reply should be prepaid.

Foot-and-Mouth Disease.—Since the issue of the *Journal* for last month was sent to press outbreaks of Foot-and-Mouth Disease have occurred in two fresh centres, namely:—

At Frettenham, near Norwich, on 13th April, and

At Elmley, Isle of Sheppy, Kent, on 20th April.

The usual Order prohibiting the movement of animals over a wide area round the outbreak was, in each case, issued the same day. The action taken has so far been successful in preventing the spread of disease (except in the Frettenham case to one other set of premises in the same parish), and it has been possible to modify the restrictions on the movement of animals very considerably in both areas.

Rabies.—One fresh case of Rabies was confirmed on the 8th April, at Colchester in one of the Inner Controlled Areas, but with that exception no case of the disease has occurred in the country since 18th February last. Since the issue of last month's *Journal* the extent of the areas subject to muzzling and movement restrictions has been reduced as follows:—

North Essex and Suffolk: by the exclusion of those parts of Suffolk previously subject to the Order and a considerable reduction of the area in Essex—on 19th April.

Buckinghamshire and District: restrictions withdrawn except from the Inner Controlled Area round Wallingford and Abingdon—as from 19th April.

South Wales: restrictions removed except from the two Inner Controlled Areas round Cardiff and Bridgend by an Order dated 4th May, operating as from the 8th of this month.

SINCE the date of the list given on pp. 1038 and 1039 of the issue of this *Journal* for January last, the following leaflets have been issued in the *Permanent Series* :—

- No. 335.—*Potash Fertilisers.*
- „ 336.—*General Instructions for Cheese-making.*
- „ 337.—*Cheddar Cheese.*
- „ 338.—*Caerphilly Cheese.*
- „ 339.—*Lancashire Cheese.*
- „ 340.—*Cheshire Cheese.*
- „ 341.—*Farm Tramways.*

In addition, the information in the following Leaflets has been revised and brought up to date :—

- No. 34.—*The Woolly Aphis.*
- „ 65.—*The Small Ermine Moths.*
- „ 86.—*Brown Rot of Apples.*
- „ 105.—*Wart Disease.*
- „ 141.—*The Preparation of Honey for Market.*
- „ 148.—*Planning and Planting a Fruit Plantation.*
- „ 192.—*Farm Butter-making.*
- „ 195.—*American Gooseberry Mildew.*
- „ 215.—*Allotments : what they are and how to obtain them.*
- „ 218.—*Associations for the Creation of Small Holdings.*
- „ 242.—*Stripe Disease of Tomatoes.*
- „ 271.—*Clover Stem-rot.*
- „ 302.—*Silver Leaf in Fruit Trees.*
- „ 320.—*The Manuring of Vegetable Crops.*
- „ 322.—*Winter Pruning Bush and Half Standard Apple Trees.*
- „ 329.—*Redemption of Tithe Rentcharge and Corn Rents : The Tithe Act, 1918.*

The following *Permanent Leaflets* have been withdrawn from circulation :—

- No. 21.—*Warble Flies.*
- „ 32.—*Foul Brood or Bee Pest.*
- „ 139.—*A Mushroom Disease.*
- „ 253.—*Microsporidiosis of Bees, or Isle of Wight Bee Disease.*

Names and Routes of the Super, King's and Ministry's Premium Stallions.—The Ministry desires to give notice that the particulars of the routes of the stallions to which premiums have been awarded by the Ministry for the Service Season, 1920, together with the names and addresses of the owners of the stallions, and of the members of the Stallion Committees which have been appointed to supervise the service arrangements, will not be published in this *Journal*. Copies of a list of the names and routes of these stallions may be obtained on application to the Ministry's Offices, 4, The Sanctuary, Westminster, London, S.W. 1.

New Duties in respect of Agricultural Vehicles.—The following proposed new scale of duties in respect of road locomotives, agricultural engines and tractors was published in a statement on revenue and expenditure issued by the Treasury on 19th April. The figures are included in the Budget proposals of the Chancellor of the Exchequer for the new Financial Year.

Vehicles of the following descriptions used in course of trade, otherwise than for the conveyance of goods, and in agriculture :—

Road locomotives and agricultural engines—			
Not exceeding 8 tons in weight unladen	£25		
Exceeding 8 tons, but not exceeding 12 tons in weight unladen	£28		
Exceeding 12 tons in weight unladen	£30		
Agricultural tractors used for haulage solely in connection with agriculture—			
Exceeding 2½ tons, but not exceeding 5 tons in weight unladen	£6		
Exceeding 5 tons in weight unladen	£10		
Locomotive ploughing engines, agricultural tractors, or other agricultural engines, if not used on roads for hauling any objects other than their own necessary gear, threshing appliances, farming implements, or supplies of fuel or water			
	5s.		
Tractors of any other description	£21		

National Agricultural Examination Board.—The 21st Annual Examination for the National Diploma in Agriculture (an examination conducted by a joint board of the Royal Agricultural Society of England and the Highland and Agricultural Society of Scotland) was held at the University of Leeds from 9th to 15th April. One hundred and twenty-seven candidates presented themselves on this occasion (as compared with 33 last year). Of the 127, 13 took all the subjects at one sitting, and 34 who had previously passed a portion of the examination appeared for the remaining subjects. The other 80 candidates presented themselves for a group of three or four subjects.

Of the 80 candidates who appeared for a group of three or four subjects, 35 passed, and are therefore entitled to present themselves for the remaining subjects in 1921.

ADDITIONS TO THE LIBRARY.

Agriculture, General and Miscellaneous—

- Simpson, J. T.*—Hidden Treasure : A Tale of Modern Farming. (303 pp.) Philadelphia and London : J. B. Lippincott Company, 1919. 6s. net. [63(022).]
- Newman, L. F., and Neville, H. A. D.*—A Course of Practical Chemistry for Agricultural Students. Vol. I. (235 pp.) Cambridge : University Press, 1920. 10s. 6d. net. [54(02).]
- Gissing, F. T.*—Peat Industry Reference Book. (292 pp.) London : C. Griffin & Co., 1920. 7s. 6d. [662.6.]
- Hall, Sir A. D.*—The Soil : An Introduction to the Scientific Study of the Growth of Crops. 3rd Edition. (352 pp.) London : John Murray, 1920. 7s. 6d. net. [63.11(02).]
- New Zealand Expeditionary Force Education Department.*—Agricultural Notes. (438 pp.) London : Director of Education, N.Z.E.F., 1919. [63(931).]
- Chelmsford, East Anglian Institute of Agriculture.*—Series A. 1, Bull 25 : An Investigation of Soil Water. (7 pp.) Chelmsford, 1920. [63.112.]
- East Suffolk County Education Committee.*—Circular 121, 1919 : Report on the Results of Field Experiments carried out during the Years 1915 to 1918, inclusive. (28 pp.) Ipswich, 1919. [63.3(04).]

Field Crops—

- N. S. Wales Department of Agriculture.*—Farmers' Bull 128 : Wheat Handling and Grading in America. (17 pp.) Sydney, 1919. [63.311 ; 66.]
- Bangor, North Wales University College (Dept. of Agriculture).*—Varieties of Potatoes, 1917, 1918, 1919. (8 pp.) Bangor, n.d. [63.512(04).]
- U.S. Department of Agriculture.*—Farmers' Bull. 1095 : Beet Top Silage and other By-products of the Sugar Beet. (24 pp.). Washington, 1919. [63.3432 ; 63.604(a).]
- Wye, South Eastern Agricultural College.*—Second Report on the Trial of New Varieties of Hops, at East Malling Fruit Experiment Station, 1918. (17 pp.) Wye, 1919. [63.3451.]
- University College of North Wales, Department of Agriculture.*—Varieties of Oats. (10 pp.) Bangor, 1919. [63.314.]
- University College of North Wales, Department of Agriculture.*—The Improvement of Rough Pasture : Eradication of Bracken. (8 pp.) Bangor, 1920. [63.33-16 ; 63.259.]
- University College of North Wales, Department of Agriculture.*—Growth of Green Crops on Arable Land for Dairy Cows. (11 pp.) Bangor, 1920. [63.33(04).]
- Lancaster County Council, Education Committee.*—Farmers' Bull. 32 :—Report on Field Trials with Varieties of Potatoes. (9 pp.) Preston, 1920. [63.512(04).]
- Lancaster County Council, Education Committee.*—Farmers' Bull. 33 :—Report on Field Trials with Varieties of Mangels. (12 pp.) Preston, 1919. [63.332.]
- Lancaster County Council, Education Committee.*—Farmers' Bull. 34 :—Report on Field Trials with Varieties of Swedes. (12 pp.) Preston, 1920. [63.332.]

Horticulture—

- Moore, W. G., and Smith, A.*—Romance of the " Wonder Plot." (84 pp.) London : Romance Publishing Company, 1920. 2s. 6d. net. [63.5(08).]

Plant Diseases—

- Sarsfield, J.*—Insect Pests and How to Beat Them, including Notes on Plant Diseases, Soils, and Manures. (202 pp.) London : C. Arthur Pearson, 1919. 3s. 6d. net. [63.27(02).]
- Sutton, M. H. F.*—The Future of the Potato Crop, with Special Reference to Wart Disease, and Immune Varieties. (21 pp.) [Jour. of Farmers' Club, February, 1920, 6d.] [63.24.]
- Hiley, W. E.*—The Fungal Diseases of the Common Larch. (204 pp.) Oxford : Clarendon Press, 1919. 12s. 6d. [63.24-49.]

Live Stock—

- Shanahan, E. W.*—Animal Food-Stuffs : Their Production and Consumption, with a Special Reference to the British Empire. (331 pp.) London : Geo. Routledge and Sons, 1920. 10s. 6d. net. [63.6:31 ; 31(42)].
- Pearse, A. W.*—The World's Meat Future. 2nd edition. (335 pp.) London : Constable & Co., 1920. 21s. net. [63.6:31 ; 664.8.]

Dairying and Food, General—

- Publow, Chas. A.*—Fancy Cheese in America : From the Milk of Cows, Sheep, and Goats. (96 pp.) Chicago : American Sheep Breeder Company, 1910. [63.73(02).]

Veterinary Science

- M'Fadyean, Sir J.*—Tuberculous Mastitis in the Cow : Its Pathogenesis, and Morbid Anatomy and Histology. (54 pp.) [Reprinted from the Journal of Comparative Pathology and Therapeutics, Vol. xxx., 1917.] [619.2 ; 614.5.]

Birds, Poultry and Bees—

- North of Scotland College of Agriculture.*—Bull. 25 :—Some Hints for Prospective Bee-keepers. (8 pp.) Aberdeen : Milne & Hutchinson, 1920. [63.81(04).]
- Paynter, F. G.*—The Development of the Poultry Industry and Small Holder Movement. (23 pp.) Hounslow : The Author, 1920. [63.651(04).]

Forestry—

- Engler, A.*—Untersuchungen über den Einfluss des Waldes auf den Stand der Gewässer. [Mitteilungen der Schweizerischen Zentralanstalt für das forstliche Versuchswesen. Band xii. (626 pp.) Zurich : Beer & Cie, 1919. [63.49-14.]
- Grieve, Mrs. M.*—Economic Trees and their By-Products. (70 pp.) Chalfont St. Peter, Bucks. : The Whins Medicinal Herb. School, n.d. 1s. 6d. net. [58.16 ; 63.49-197.]
- Kew, Royal Botanic Gardens.*—Official Guide to the Museums of Economic Botany. No. 4, British Forestry. (143 pp.) London : Royal Botanic Gardens, 1919. 2s. net. [579 ; 63.49(064).]

Engineering—

- Malcolmson, V. A.*—Rural Housing and Public Utility Societies. (8 pp.) London : John Murray, 1920. 6d. net. [69(04).]

Economics—

- Rew, Sir R. H.*—Food Supplies in Peace and War. (183 pp.) London : Longmans Green, 1920. 6s. 6d. net. [63(08) ; 31(42).]
- Jackson, T. C.*—The Agricultural Holdings Acts, 1908-1914, together with a Manual on Tenant-Right Valuation. [4th Ed.] (300 pp.) London : Sweet & Maxwell, 1920. [347(a).]
- National Farmers' Union.*—What the N.F.U. is Doing for the Farmer. A Brief Record of the Work of some of the Committees at Headquarters during the year 1919-20. (47 pp.) London : National Farmers' Union, 1920. [63(06).]

The FARMERS' "WARDEN"



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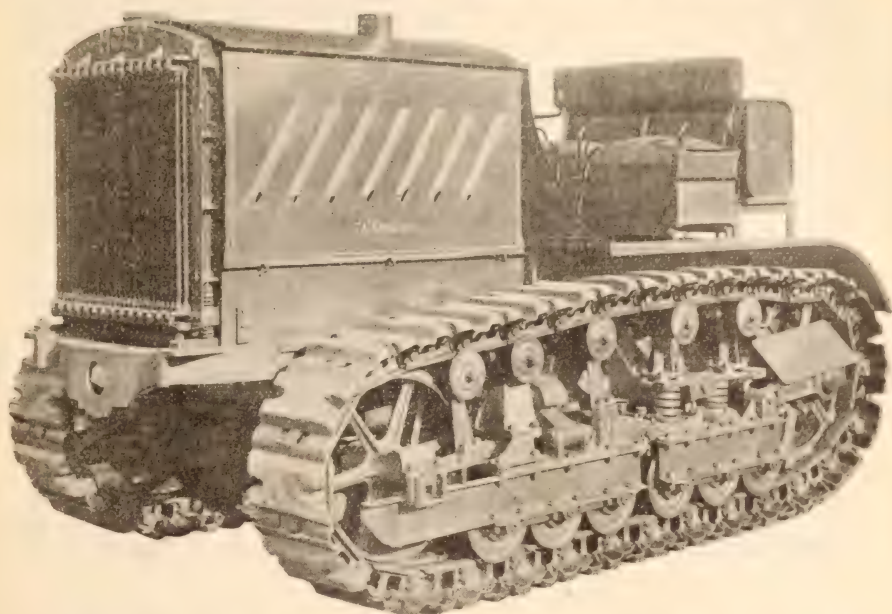
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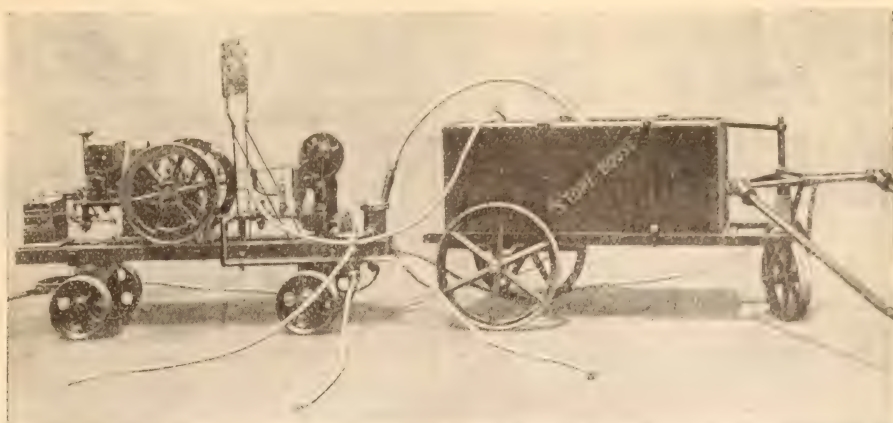
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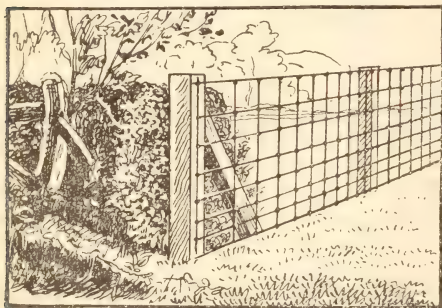
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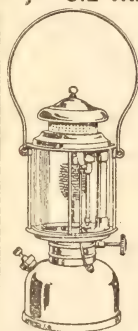
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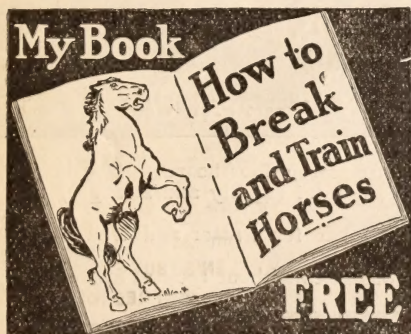
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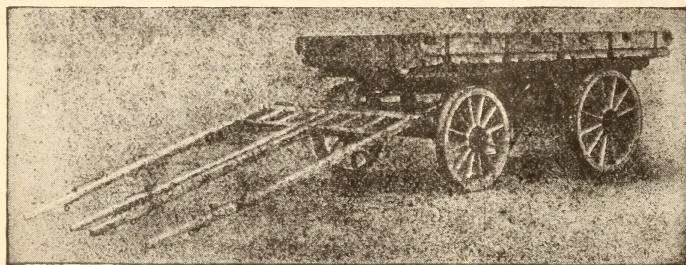
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